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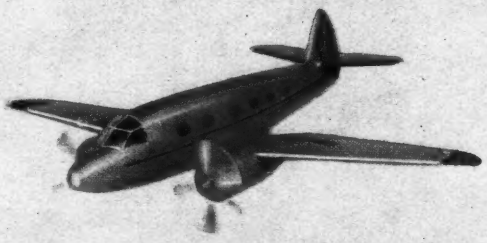

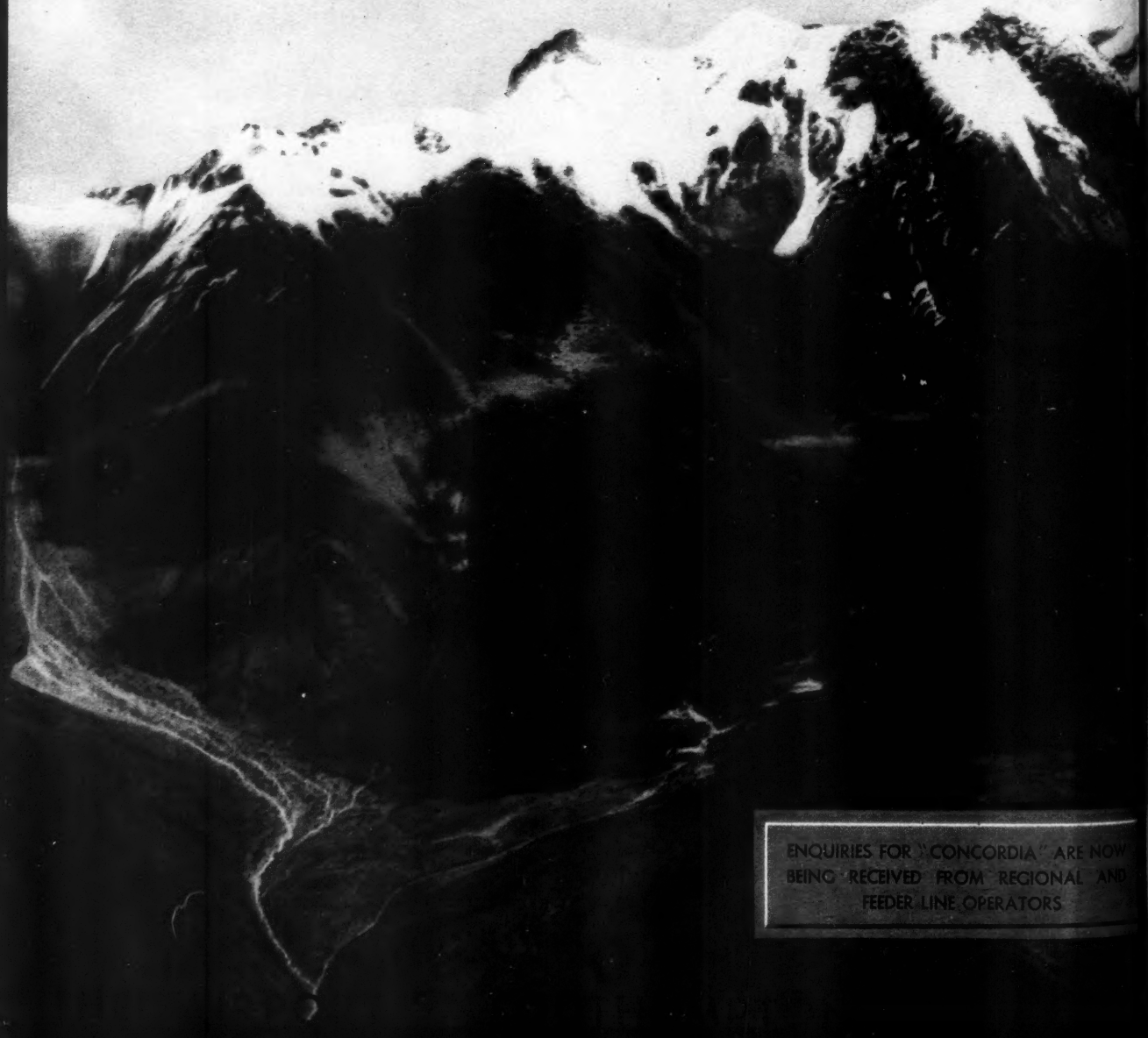

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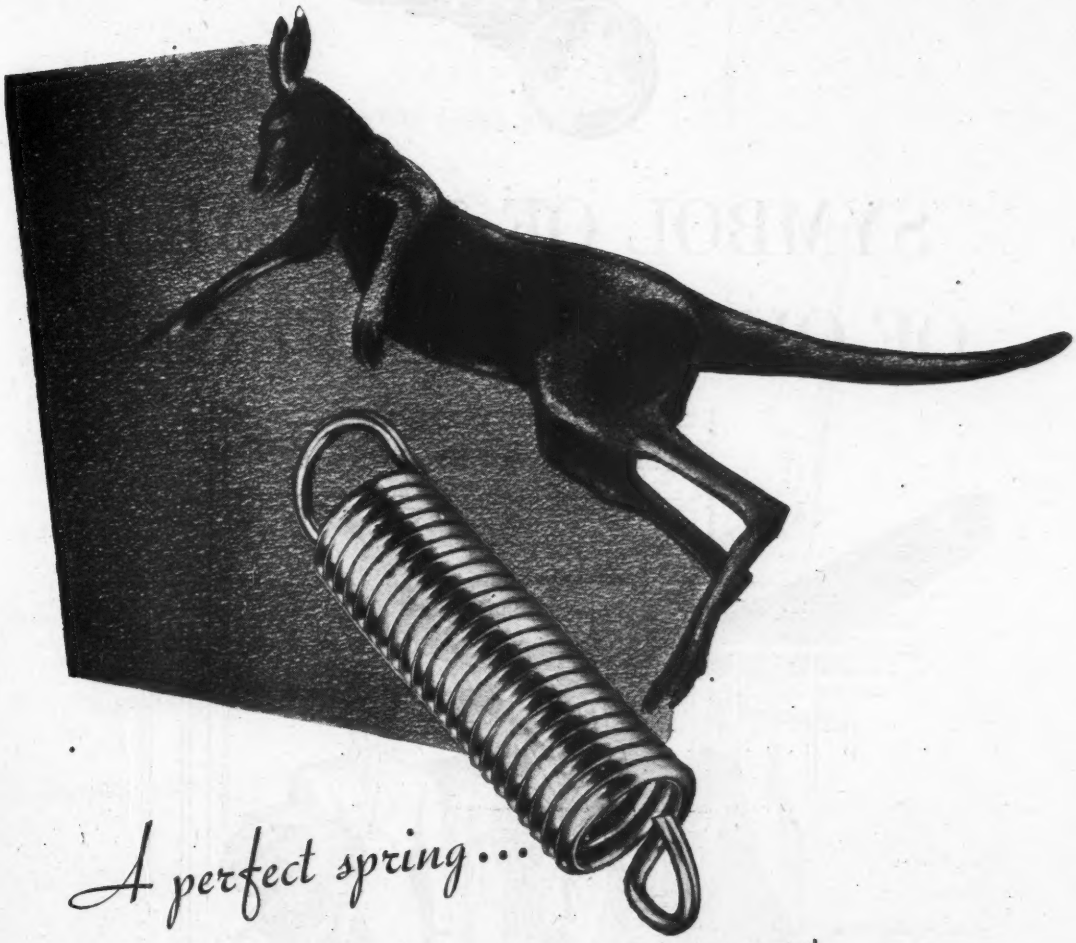

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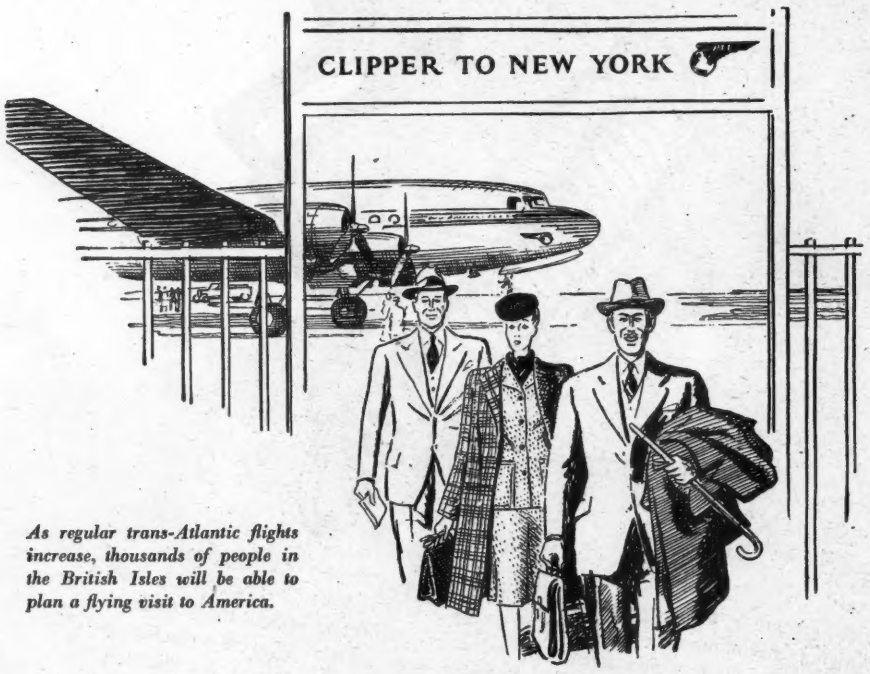

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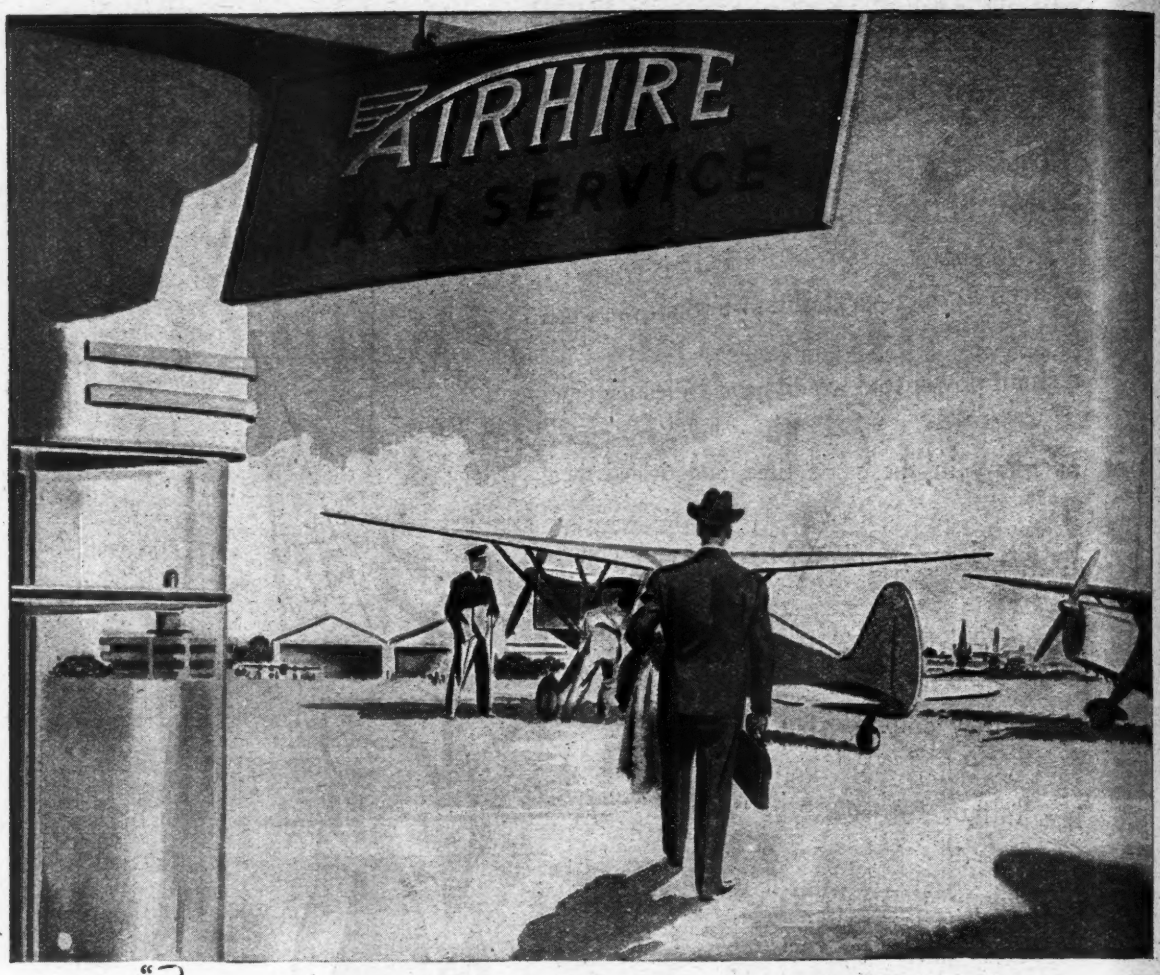

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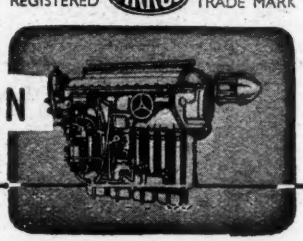

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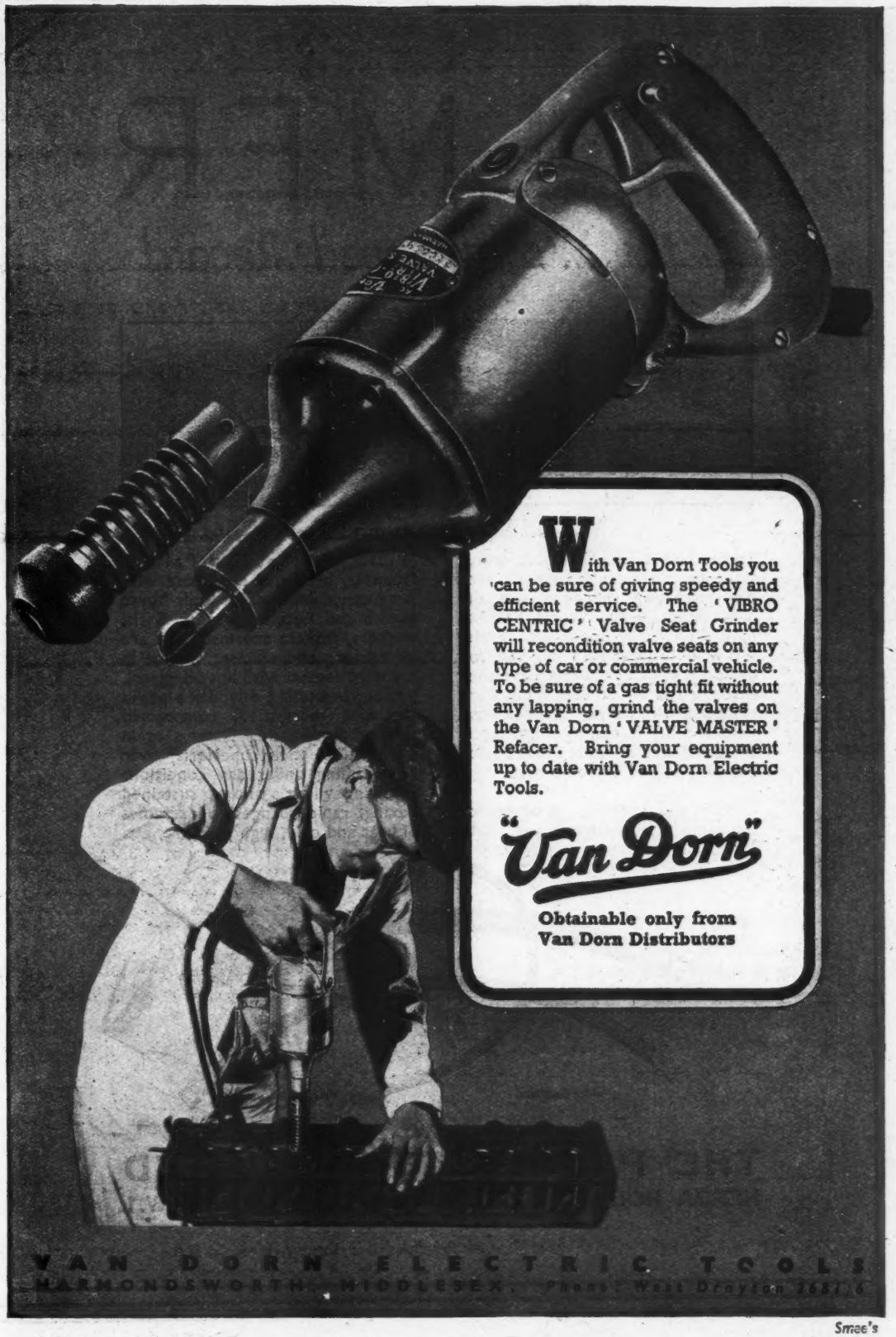
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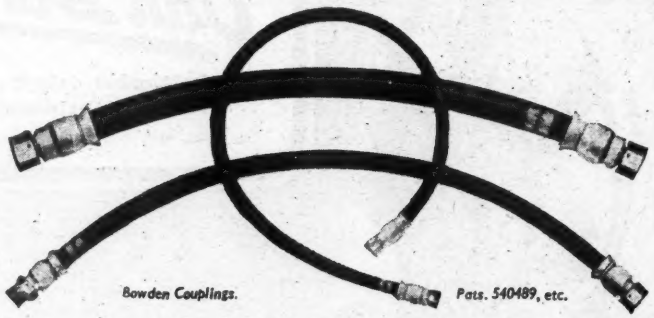

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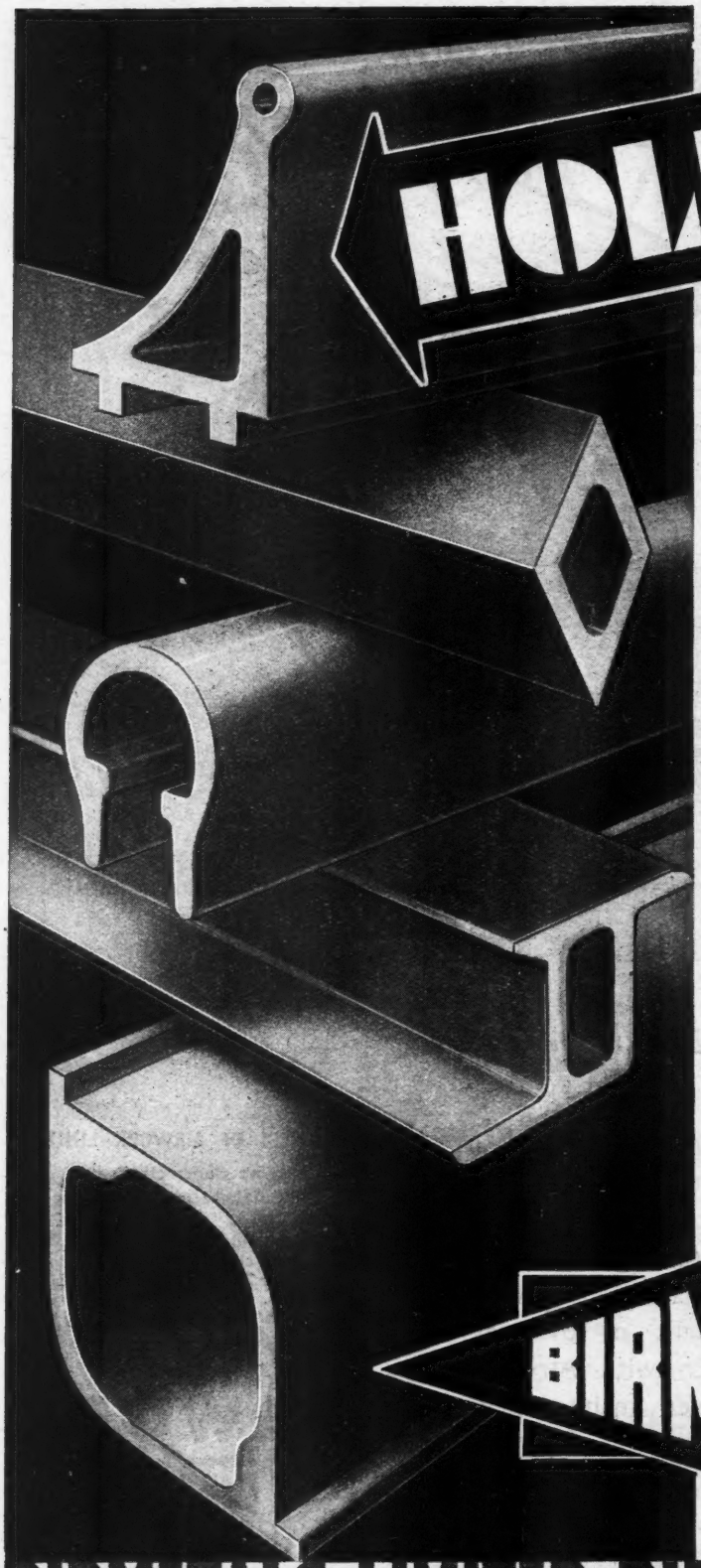

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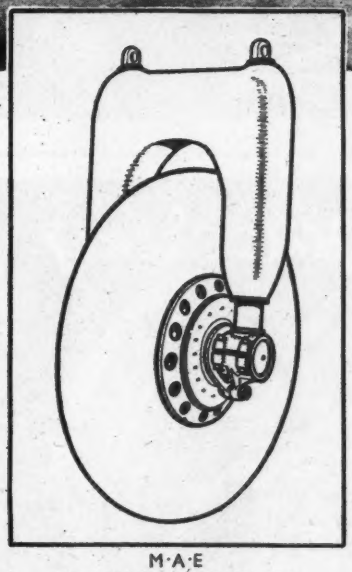

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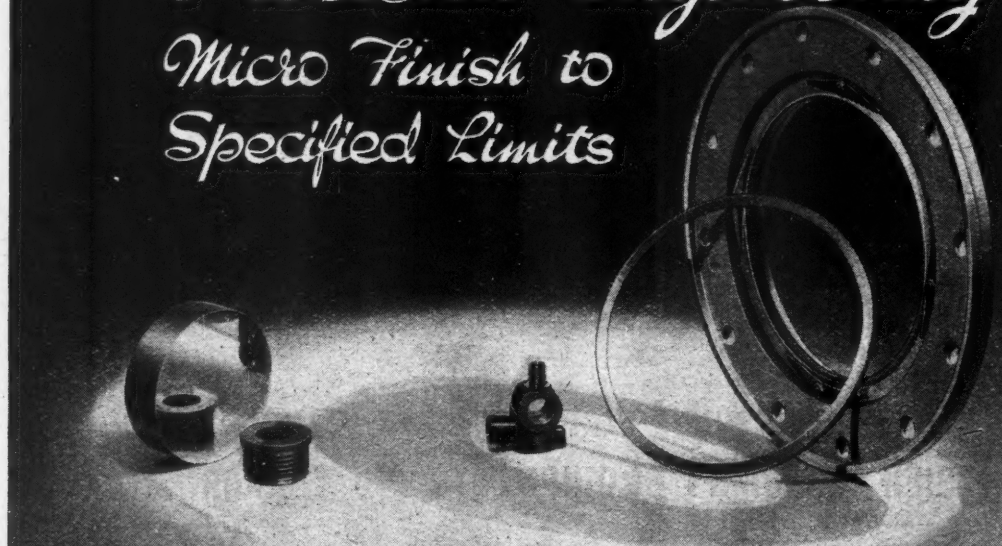

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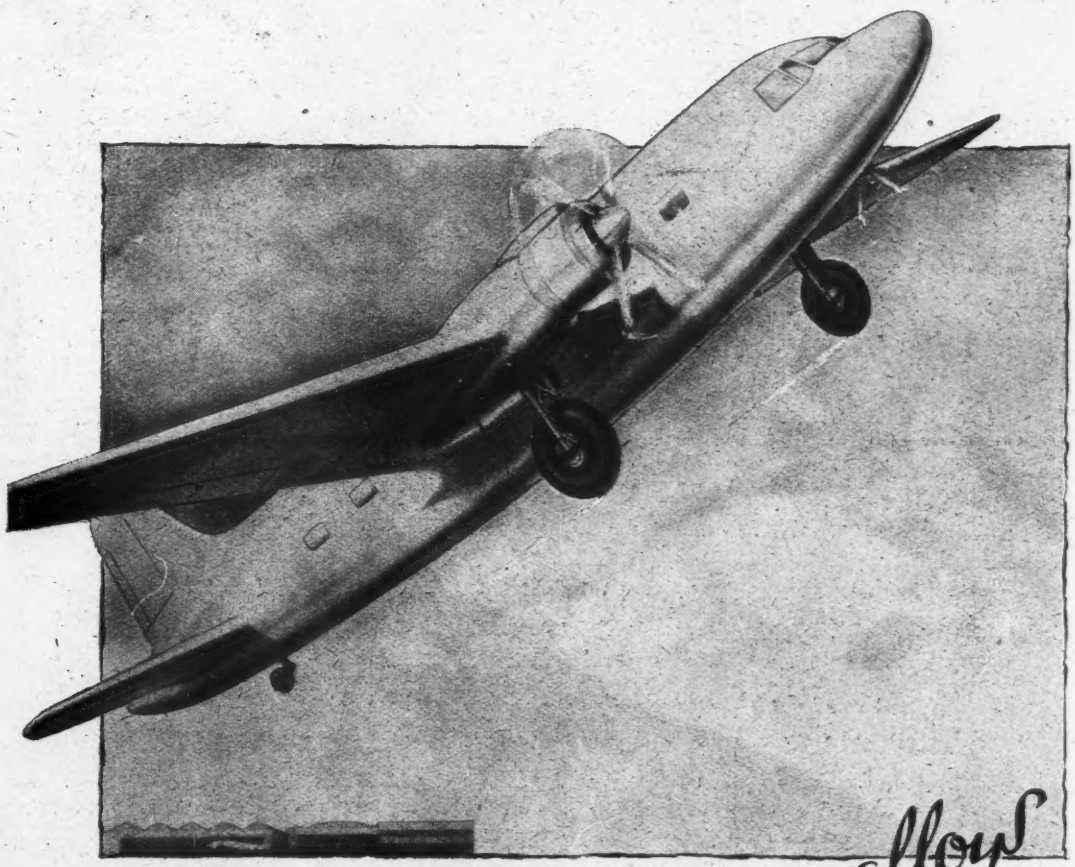

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The Outlook

Shooting a Star Across America

BRITISH aviation circles will applaud in all sincerity the splendid feat by our American friends in sending a Shooting Star jet-propelled aircraft across the United States from coast to coast in the incredibly short time of 4 hours 13 minutes. In some ways the flight appears to have been even more remarkable than Group Captain Wilson's world's speed record of 606 m.p.h. on the Gloster Meteor. That flight was made over a short course, and it was only necessary to carry fuel for less than one hour's duration all told.

Making every allowance for the fact that the American machine must obviously have had a very powerful ally in the form of a tail wind, which made it possible to cover the coast-to-coast distance, there is no gainsaying the really significant feature that the Shooting Star remained in the air for nearly four and a quarter hours at what must have been very nearly full throttle. Whether or not the jet unit in the P-80 was a very special one has not been disclosed, but it appears that the other two machines which started landed *en route* to refuel, so it rather looks as if the one piloted by Col. Councill either had a power plant with lower specific fuel consumption, or else that he was more lucky than the others in choosing the right compromise between throttle opening and ground speed.

Pictures of the Shooting Star show large long-range tanks on the wing tips, and doubtless the wings themselves carried as much tank space as could be crammed into them, but, even so, the feat of obtaining more than four hours' duration is no mean one. Congratulations to all concerned. We in this country know enough about the difficulties to appreciate the merits of the flight.

The announcement that America is going after Wilson's record will be generally welcomed in this country. On both sides of the Atlantic we are faced with the problem of "getting through the compressibility wall," as Air Commodore Banks put it. Striving with might and main to beat one another in pure speed will do much towards "improving the breed," just as did the series of Schneider Trophy Contests in years gone by. And here we might recall the interesting fact that it was America who, by putting some very fine aircraft up against us, compelled us to make a real effort, which ultimately resulted in our winning the Schneider Trophy outright. We cannot win the world's speed record outright, but we *can* try to raise it so much that it becomes extremely difficult to beat. So, of course, can America. It should be interesting to watch the "scrap."

Essential Priorities

WHILE the Ministry of Civil Aviation is obviously treating airline development, under its new nationalised guise, as being of the utmost importance, and while valuable management personalities have agreed to come in and do their best to make a success of the new set-up, air transport must continue to be at a disadvantage unless the highest all-round priorities can be obtained for all the work involved.

At the moment, and particularly where the new European Division of B.O.A.C. is concerned, the outstanding shortages are those of accommodation and flying personnel. Even if, by a miracle, we could suddenly find ourselves in possession of a fleet of several hundred new civil aircraft it would still not be possible to make good use of them. There would be insufficient storage space for them, too few trained crews to fly them, and insufficient accommodation for the maintenance personnel.

Obviously, if British air transport is considered by the Government and the electors to be of vital importance, then, one way or another and by influence at the highest levels, absolute priority must be obtained for all work in connection with its development. At the new London terminal the European Division is working in the worst possible conditions, with neither proper accommodation nor adequate servicing facilities, while the need for full

and comfortable training facilities will be equally necessary at the airfield which is being handed over to B.O.A.C. as a training centre. So building priorities are also inextricably linked with the second bottleneck—that of aircrew supply.

In last week's issue we stressed the need for practical transport flying experience in the constitution of the boards of the three corporations, and it is pleasant to learn that, at least so far as the European Division is concerned, such experience is to be introduced as soon as possible. Even in its present form the European management includes at least two men with useful flying experience of a more normal kind. One of these, Mr. Philip Wills, is making his first appearance as an airline executive, though he spent the greater part of the war as Mr. d'Erlanger's right-hand man with Air Transport Auxiliary, and his ability has been amply proved. Nevertheless, we cannot help feeling that, when other people with equal technical and administrative abilities are available in B.O.A.C., there may be a few hard feelings about this and other appointments. In such an organisation the need for contentment is almost as great as the need for efficiency.

Finally, it might be said that the decision to install the headquarters of the European Division at Northolt itself shows very much the right attitude. For much too long administration has tended to be divorced from hard realities, and the practical management is likely to be immensely improved by day-to-day contact with the flying, maintenance and operational sections.

Certification of Foreign Aircraft

THE recent announcement that a number of Ju 52 transport aircraft are to be used by British operators brings up the subject of certificates of airworthiness. These machines will, in the public interest, be given a British certificate, but the Ministry of Civil Aviation and the Air Registration Board have decided, quite rightly we think, that this case should be regarded as an exception, and that, generally speaking, British certificates will not be issued to aircraft of foreign origin.

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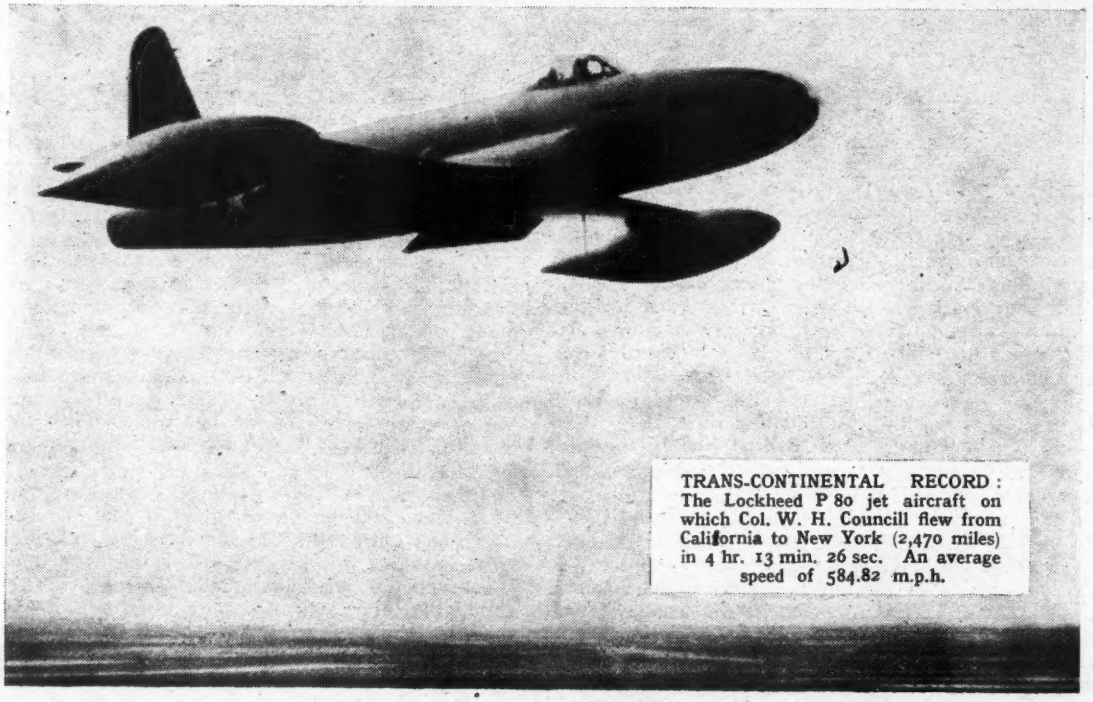
Purchasers and potential purchasers of foreign aircraft should take note of this fact, and should make quite sure that the seller of a foreign aircraft is in a position to transfer with the aircraft all the necessary documents relating to airworthiness. Cases have already occurred of machines being bought which have no history attached to them.

The man who has acquired a foreign aircraft is not, of course, necessarily debarred from flying it in this country. It is laid down in the International Convention that a foreign certificate of airworthiness issued by the country of origin may be validated by the British authorities. To obtain this validation, a current certificate from the country of origin must be produced, or such a certificate already validated by another country which is either a contracting party to the I.C.A.N. or is issued by a country with which the United Kingdom has made a bilateral agreement of reciprocal validation of certificates.

Unless, however, all the necessary papers relating to an aircraft are available, it is obviously difficult, not to say impossible, for the British authorities to grant the validation. An aircraft with no history, even if of an approved type, may have been crashed and repaired during its life, and the quality of the repair must obviously be known before validation can be granted.



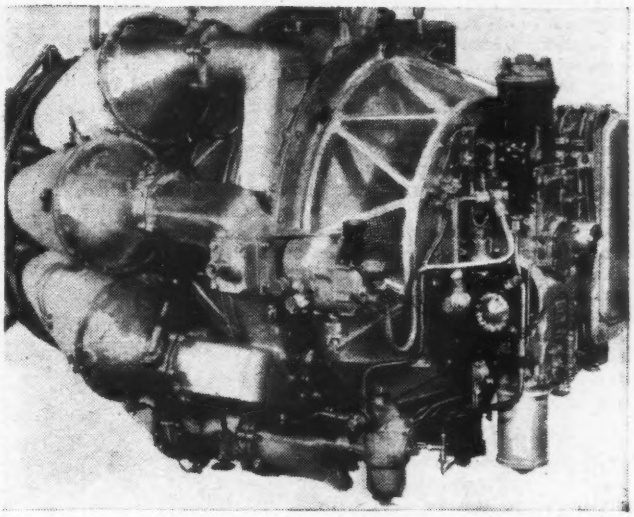
TRANS-CONTINENTAL RECORD: The Lockheed P 80 jet aircraft on which Col. W. H. Councill flew from California to New York (2,470 miles) in 4 hr. 13 min. 26 sec. An average speed of 584.82 m.p.h.

"River Class" Evolution

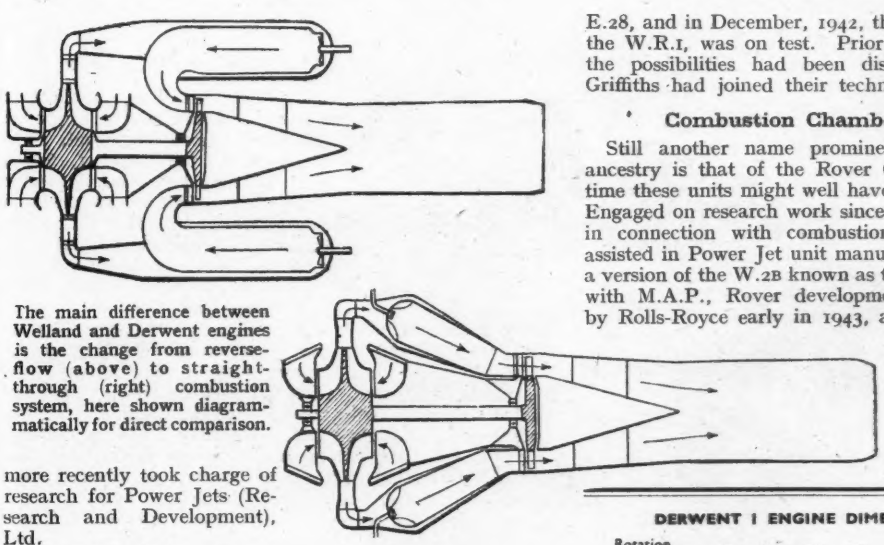
Rolls-Royce Aircraft Turbine Developments Summarised : Details of the Derwent V Turbine-Jet and the Trent Experimental Turbine-airscrew Unit

SO rapid is the progress of the gas turbine for aircraft propulsion that almost every week brings news of additional developments. The brilliant pioneer work of Air Commodore Whittle and his associates has now become history; the record of the painstaking early work from 1930, and also the later association with Power Jets, Ltd., B.T.-H., Ltd., and Rolls-Royce, Ltd., has been disclosed in a recent lecture.* No amount of verbal wrangling will detract from the credit due to them, nor will it bring into the true picture those, particularly in other countries, who seek now to associate themselves with the successful introduction of the turbine-jet propulsion system. To give credit where it is due, the original Whittle unit of 1936, which followed his 1930 patent, No. 347206, is the prototype of all radial compressor-turbine-jet propulsion units; however, as early as 1926 Dr. A. A. Griffiths, then at the R.A.E., had indicated that the gas turbine for aircraft was a reasonable project, and in 1929 he enumerated the main advantages that could be expected from the development of such a power unit. Thus Whittle was not quite alone in his belief in the gas turbine.

About the time the first Whittle unit reached the test bed, H. Constant also joined the ranks of active supporters with a paper, "The Internal Combustion Turbine as a Power Plant for Aircraft." After directing turbine research at Farnborough, Mr. Constant more recently took charge of research for Power Jets (Research and Development), Ltd.



A part of the Derwent V, from which can be seen the right-angled box-section ducts between blower casing and combustion chambers. The absence of an oil cooler is also apparent.



The main difference between Welland and Derwent engines is the change from reverse-flow (above) to straight-through (right) combustion system, here shown diagrammatically for direct comparison.

The third Whittle experimental engine produced by Power Jets was found sufficiently successful to merit flight tests, and the W.1, aerodynamically and thermodynamically similar, was installed in the Gloster E28/39, a first flight being made in May, 1941.

In quick succession, the W.1A, W.2 and W.2B followed, and it was from the W.2B that the first successful Rolls-Royce-built turbine jet engine was evolved. The Rolls-Royce company had first become convinced of the practical future for this type of unit after the successful flight of the E.28, and in December, 1942, their first experimental unit, the W.R.1, was on test. Prior to this, as early as 1938, the possibilities had been discussed, and in 1939 Dr. Griffiths had joined their technical staff.

Combustion Chamber Development

Still another name prominent in the "River-class" ancestry is that of the Rover Company; in fact, at one time these units might well have been the "Rover Class." Engaged on research work since early in 1940, particularly in connection with combustion chambers, this concern assisted in Power Jet unit manufacture and later produced a version of the W.2B known as the B.23. By arrangement with M.A.P., Rover development work was taken over by Rolls-Royce early in 1943, and after modification and improvement the B.23 became the Welland. This first member of the River Class was a reverse-flow design of 43in. diameter and

DERWENT I ENGINE DIMENSIONS AND DATA

Rotation	L.H.
Maximum external diameter	43.00in.
Length to exhaust cone flange	84.00in.
Length of jet pipe	38.50in.
Propulsion nozzle internal diameter	13.08in.
Compressor impeller diameter	20.68in.
Turbine rotor diameter	17.38in.
Diffuser throat area	38 sq. in.
Impeller diameter	20.68in.
Impeller max. tip speed (16,600 r.p.m.)	1,500ft./sec.
Combustion temp.	1,800 deg. C.
Turbine temp.	850 deg. C.
Max. jet pipe temp.	690 deg. C.
Compression ratio	3.9 : 1
Fuel/air ratio (at burner)	18 : 1
Fuel/air ratio (overall)	60 : 1
Dry weight—including oil tank and cooler	975 lb.

* *"Early History of the Whittle Jet Propulsion Gas Turbine" by Air Commodore Frank Whittle, C.B.E., R.A.F., M.A., Hon. M.I.Mech.E., delivered to the Institution of Mech. Engineers, on October 5th, 1945.*

"RIVER CLASS" EVOLUTION

850 lb. weight. It flew in the Gloster E.28, and after further development it was conservatively rated at 1,450 lb. thrust and became the power unit for the twin-engined Meteor prototype, the Gloster F9/40.

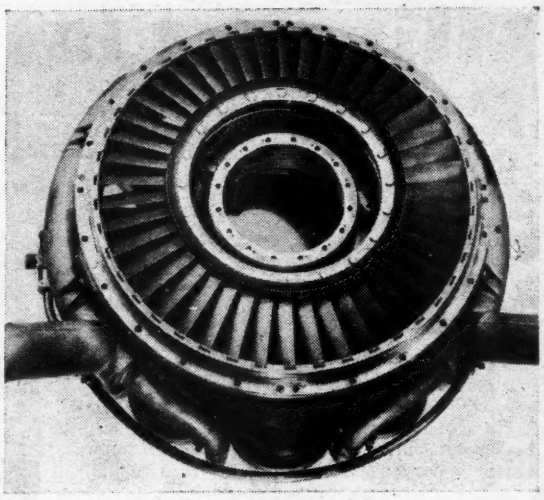
In addition to producing the improved B.23 design from the W.2B, the Rover Company produced a unit with considerably modified layout, which they called the "straight-through" engine. Hitherto, contra, or reverse-flow, combustion chambers had been employed but, in the new conception, combustion chambers were arranged with inlet towards the front of the engine and outlet directed rearwards into the discharge nozzle in front of the turbine.

Although some merit might still be found in the original reverse-flow layout, the straight-through design at once showed considerable promise. While the overall diameter was unchanged, a rather more compact engine resulted, and there was no restriction on turbine diameter. Designated the Rover B.26, this unit, together with the Power Jets W.2/500, formed the basis of the Rolls-Royce B.37 or Derwent. As will be appreciated from a comparison of power ratings, the introduction by the Rover Company of the straight-through combustion system constitutes a most important feature in recent gas turbine development.

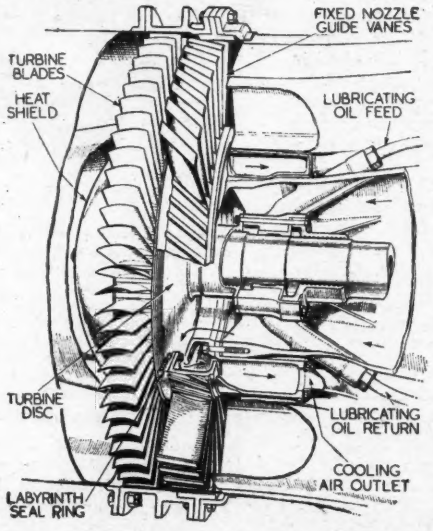
Meteor Power Units

By 1944 the Meteor with Welland engines had reached squadron stage in the R.A.F., and with a clear 25 m.p.h. speed margin over any other Allied military aircraft made a timely addition to our flying-bomb defences.

The Derwent, the second River-class engine, had by this time been further developed by Rolls-Royce and, as stated, the main difference lay in the adoption of straight-through combustion. Subsequent marks of the Derwent, the II and IV, each showed about 10 per cent. thrust increase over the designed 2,000 lb., and the Derwent V, which later powered the record-breaking Gloster Meteors, passed the official



Turbine guide vanes on the rear side of the discharge nozzle assembly.



The rear bearing and turbine disc are cooled by air from an auxiliary fan. This section is of Derwent I components.

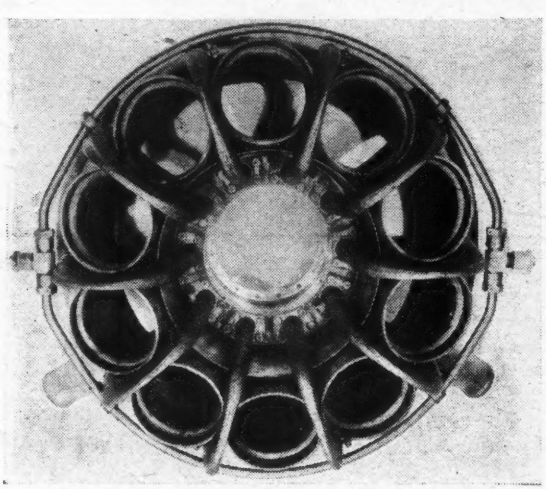
100-hr. type test at a rating of 3,000 lb. thrust. As an indication of simplicity of design as compared with the piston engine, it is noteworthy that the complete Derwent V, which is somewhat different from the earlier Derwents, was produced straight from the drawing board, and it was the first-engine-off that passed the type test. Since that time the Derwent V has undergone intensive development and now gives 4,000 lb. thrust.

Derwent V Details

The Derwent V is, in effect, a scaled-down version of an improved scaled-up Derwent I layout. The larger unit, the R.B.-41, is at present being developed to meet a single-seater fighter specification calling for a minimum of 4,000 lb. thrust, an installed weight of 2,200 lb. and a maximum diameter of 55in. More will be said of this power unit later.

The Derwent V was prompted by the great promise shown by the larger design and because the Meteor had shown itself capable of utilising thrust greatly in excess of the original estimates. Intensive work resulted in the designing, building and testing of a new Derwent in just under six months. Subsequently it resulted in the establishment of a new world's air-speed record of 606 m.p.h.

Certain details of construction could not be mentioned when the original Derwent and its development was described in *Flight* of October 25th, 1945. These are now worthy of review and comparison with Derwent V components. It may be assumed that most of the detail improvements will be featured in the larger engine series. A radial compressor of increased capacity is, perhaps, the most important single modification. This is of the double-entry type as on all Derwent engines, but, on the V, the main shaft coupling compressor and turbine is mounted in two roller bearings and a central ball thrust bearing instead of plain bearings. The central ball bearing adjacent to the shaft coupling provides a definite axial location and supports the axial thrust of the turbine rotor. It is of a



The combustion chamber seatings at the front of the discharge nozzle. Cooling-air pipes may also be seen.

THE HAWKER TEMPEST II (*Bristol Centaurus Engine*).

[*Advt.*

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"RIVER CLASS" EVOLUTION

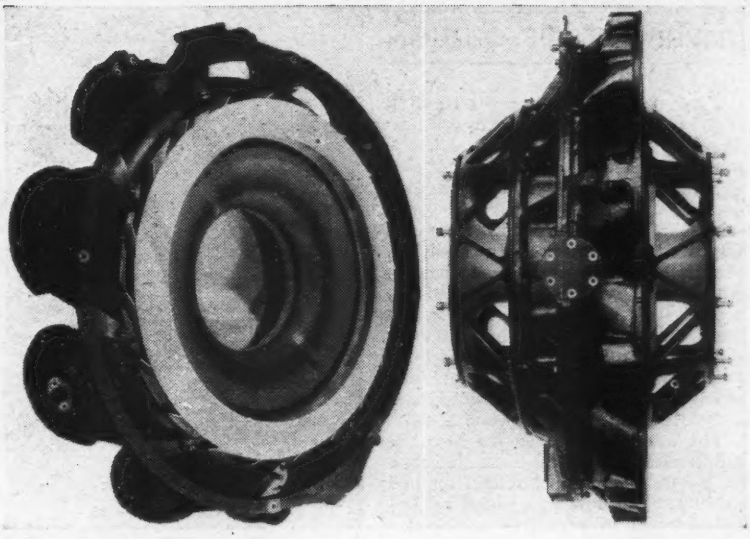
special deep-grooved type, which was developed for the supercharger of the Griffon piston engine. The two roller bearings are located forward of the rotor and impellor.

The compressor impeller and the turbine rotor are each dynamically balanced, and then finally balanced as a complete rotating assembly. It was found, however, that balance is likely to be upset if rotors are unbolted and reassembled. This constitutes an important reason for the division of the drive shaft from turbine to compressor. The shaft connection comprises a quickly-detachable toothed coupling, which transfers all the power from the turbine to the compressor shaft, and a grooved ball joint on the axis which incorporates a lock of the bayonet type. The sequence of operations required to remove the turbine rotor and shaft is as follows:—Insert hand through an access hole in the intermediary casing; disengage two spring detents and slide back the lock ring which they locate; withdraw the outer toothed coupling; turn the shaft through 30 deg. to break the bayonet interlock of the ball coupling; withdraw rotor and shaft rearwards.

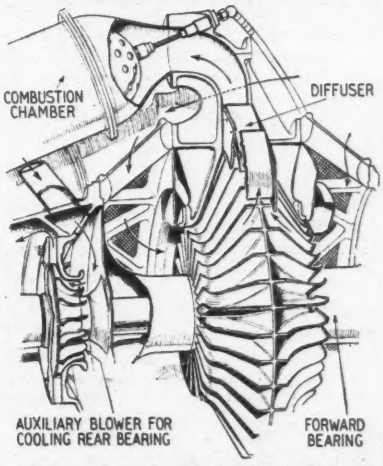
Cooling of Bearings

As the plain type bearings used on the Derwent I have been replaced by roller bearings on the Derwent V, no oil cooler is fitted. A triple gear-type pressure pump supplies oil through a filter to the various bearings, and two scavenge pumps return the oil to the pressure side.

As two tons of air are delivered each minute by the main compressor, the provision of a separate centrifugal fan to provide cooling air for the centre and rear bearings and the turbine disc seems at first sight superfluous. It



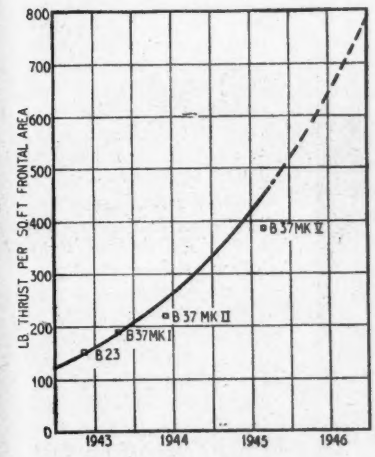
(Left) The rear half of the compressor casing with diffuser in position, and (Right) the complete compressor casing and assembly.



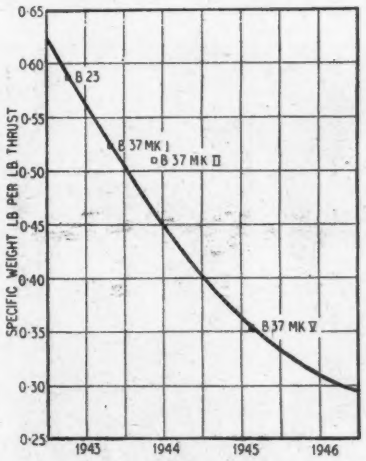
The main air flow from the double-sided compressor to the combustion chambers. Note also the cooling fan.

is, however, well justified in that the air leaving the main compressor normally has a temperature of about 200 deg. C., whereas the auxiliary blower can supply the air at about 30 deg. C. The extra rotor is a die casting, cheap to produce, and requiring only 18 h.p. to supply the requisite volume of air, while it is estimated that to by-pass the air from the main compressor would involve an expenditure of about 50 h.p. Another consideration is that air for cabin pressurising is taken from the main supply, and there is an understandable reluctance to reduce further the output of the main compressor.

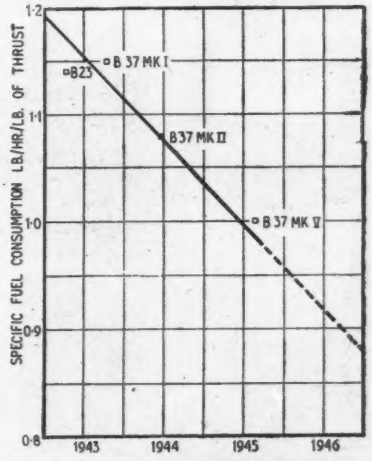
Another apparent difference in



An increase in thrust per square foot of frontal area from 150 lb. for the Welland to 350 lb. for the Derwent V was shown in a period of two years.



The specific weight per lb. of thrust has improved from 0.57 for the Welland in 1943 to 0.36 for the record-breaking Derwent V in 1945.



The Welland gave a specific fuel consumption of almost 1.15. The figure for the Derwent I was 1.07, while the Derwent V has reached unity.

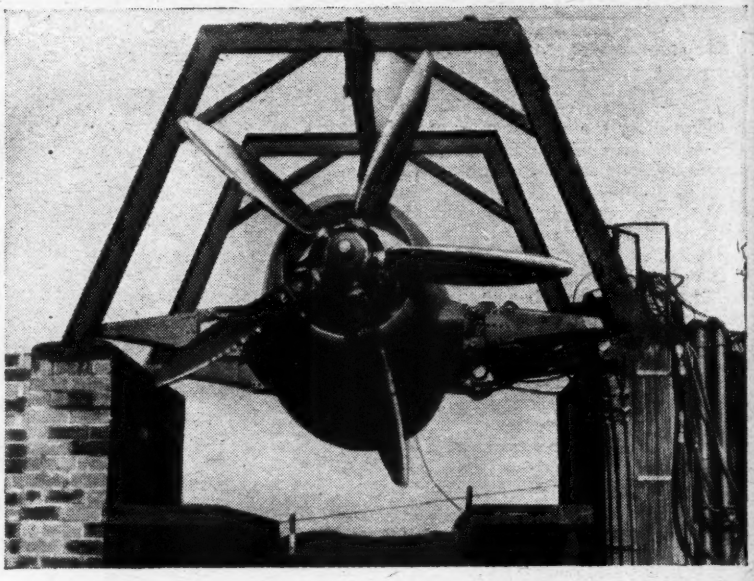
"RIVER CLASS" EVOLUTION

design between the Derwents I and V is the reduction in number of combustion chambers from ten to nine in the later engine. The Derwent V chambers are similar but have a greater cross-sectional area to cope with the increased airflow from the improved compressor. In addition, the outlets from the blower casing, which were previously curved elbows, are now of an improved box section and a fully machined aluminium casting is substituted for the built-up diffuser vane ring assembly. A strengthened diffuser has resulted and fatigue is reduced at the vane tips.

The later mark of engine also has a different fuel control to the burners. Originally the pump stroke remained fixed and the flow was varied by by-passing fuel in excess of engine demand. On the Derwent V the stroke of the engine-driven pump, and therefore its capacity, is regulated by means of a servo system under barometric control; it is also subject to the over-riding control of a governor which would prevent excessive engine speeds. Finally, after delivery to the throttle valve, the supply of fuel to the engine burners is regulated by the pilot from the cockpit. The development and production of all the regulating equipment is the work of Joseph Lucas, Ltd.

In view of the high operating temperatures, the discharge nozzle box at the rear of the combustion chamber is now cast instead of fabricated; this measure was adopted to obviate splitting or cracking at a welded joint. Previously the blades in the nozzle assembly were seated on an inner ring retained by small rings clamping the blade foot on each side. An improvement has now been made in the securing of the vanes by employing a buttress type of support, which reduces the differential expansion of the vanes and casings.

The most recent and powerful addition to the River Class of turbo-jets, the R.B-41 or Nene, which was mentioned earlier in connection with the Derwent V development, has an overall diameter of 49in. and a weight of approximately 1,600 lb. This unit was also produced within six months of work commencing and gave a thrust of 4,200 lb.; after development 5,000 lb. thrust will be within its capacity. Some idea of the remarkable progress made in Rolls-Royce turbine-jet design will be gained from a study of the specific weight, thrust per square foot of frontal area and specific fuel consumption curves given on p. 133.



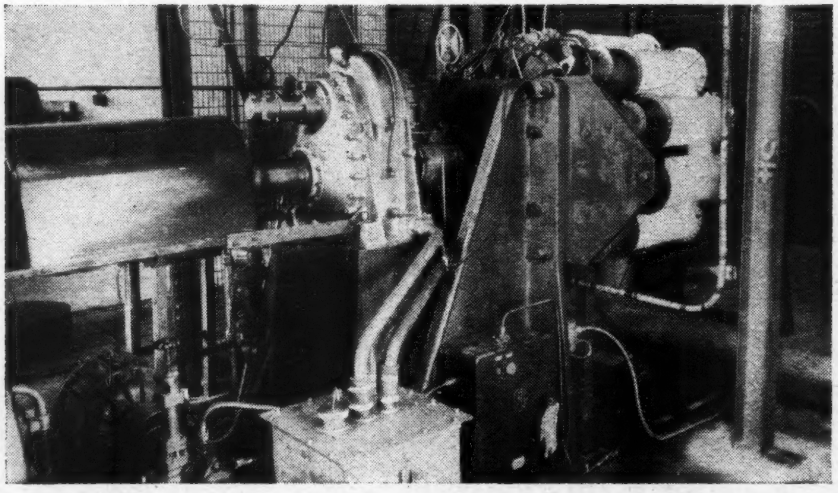
The Trent turbine-airscrew unit in its test rig. The small-diameter, five-bladed airscrew was fitted for installation in the Meteor, ground clearance being insufficient for a larger airscrew. The jet gave 1,500 lb. thrust, the airscrew 750 b.h.p.

Trent Turbine-Airscrew Unit

In addition to their turbo-jet development the Rolls-Royce Co. have also produced an experimental turbine/airscrew unit known as the Trent, which was hangar-tested in March of 1945. In September of the same year it became the first unit of its kind to undergo flight trials. For this purpose two were installed in a Gloster Meteor.

Experimental work with this type of engine dates back to May, 1944, when a compressor-turbine unit was equipped with a spur-type reduction gear and tested for shaft horse-power. The present Trent engine, which was produced purely to gain experience with a unit combining jet and airscrew propulsion, is still virtually a Derwent with reduction gear and small-diameter five-bladed airscrew added. Approximate weights during early development, are as follows:—

Weight of turbine unit, 1,000 lb., airscrew 250 lb., and reduction gear 250 lb. Total, 1,500 lb.



A Welland fitted experimentally with a spur-type reduction gear, on test for shaft horse power.

Other recent articles referring to the development and production of Rolls-Royce turbo-jet engines have appeared in "Flight" as follows: Rolls-Royce Derwent Engines (description), October 25, 1945; British Aircraft Gas Turbines and Gas Turbine Problems, by Dr. Roxbee Cox, December 20 and 27, 1945; Combustion Research, January 3, 1946; and The Jet-Engine Fuel System, January 10, 1946.

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including unsupercharged and supercharged, direct-drive and geared versions cover the range from 145 to 330 b.h.p. take-off power

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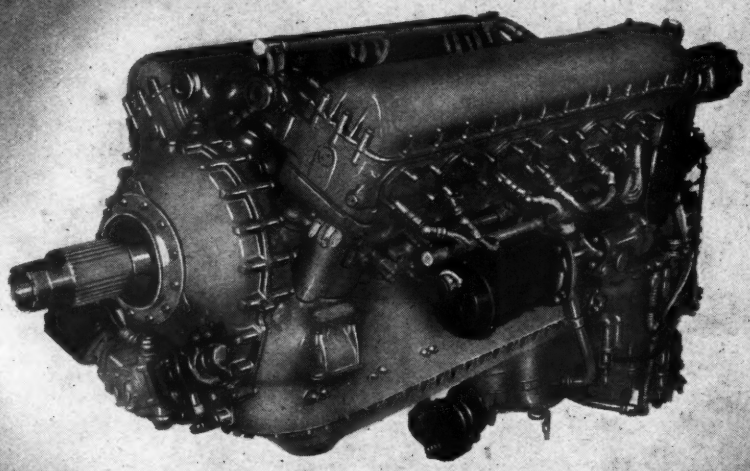
MAKING HISTORY IN THE AIR-AGE

Round the World

WITH ROLLS-ROYCE AERO ENGINES

The first Rolls-Royce Merlin-powered Lancastrian delivered to R.A.F. Transport Command on December 19th, 1945, completed a 34,000 mile flight round the world in 144 hours flying time. No special servicing arrangements were made, no trouble whatever was experienced. A senior officer said, "We couldn't have wished for better engines".



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AERO ENGINES

For Speed & Reliability

ROLLS-ROYCE LTD. DERBY. London Office: CONDUIT ST. W.1.

HERE AND THERE

NO RECIPROCATION: The Vultee XP-81 fighter combines a gas turbine-driven airscrew (see exhaust amidships) and a jet-propulsion unit behind the cockpit. Cruising at over 500 m.p.h. is claimed.

Or So He Says!

A READER weighs in with this little story which we pass on with pleasure if not with credulity: He was, he says, visiting a strange town and, it being a Thursday, he entered a newsagent's shop and asked the blonde behind the counter:

"Do you take *Flight?*"

She happened to be new to the job and replied: "No, not very easily!"

U.S. Challenger

SO the Lockheed Shooting Star is to attack the World's Air Speed Record in March!

The announcement of this challenge to the 606 m.p.h. record held by the Gloster Meteor was made shortly after the report that a P-80 with extra tanks had clocked 584 m.p.h. in a non-stop flight from Long Beach, California, to New York, setting up a new American "Coast-to-Coast" figure of 4hr. 13min.

Incidentally, the pilot, Col. William H. Councill, is recorded as saying that he "sometimes flew at 660 m.p.h., but was never full out."

The venue of the March attempt at the official international record is Muroc Dry Lake, in the Mohave Desert about 70 miles north-east of Los Angeles, the scene of many a motor speed trial.

V.I.P. Shortage?

WITH the transfer to the control of the British European Division of B.O.A.C. of the R.A.F. services to Paris, Brussels and Amsterdam, the Priorities Board have released their claim on seven of the fifteen seats in each aircraft. These seven seats will be available for ordinary fare-paying passengers. The remaining eight seats in each aircraft will continue to be reserved primarily for Government-sponsored passengers.

The allocation of all seats on British airlines have, in the past, been controlled by the Prorities Board, and so this partial release of air passages to the public is a welcome, even if small, concession.

High-speed Impressions

MANCHESTER Branch of the R.Ae.S. resumed activities last month, after a five-year war lapse, with a meeting that had what the cinema folk would call a very good "box-office appeal."

The special attraction was a lecture by Mr. Eric Greenwood, Gloster's chief test pilot, on the World's Air Speed Record, and although it was a Thursday evening this pulled more than 100 members away from the rival radio attraction of "Itma."

It was in replying to a question from Mr. Roy Chadwick, the chairman, that Mr. Greenwood said his impressions at high speed as he passed the marker buoys, 3000yd. apart, could be likened to the "cat's-eyes" studs in the road flashing past a motor car travelling at 60 m.p.h.

Which reminds one of the celebrated remark of the Bentley driver to his passenger, "A high fence, my foot! They're telegraph poles!"

Wot, No Secrecy?

WHEN the Home Secretary, Mr. Chuter Ede, intimated in the House last week that he did not think conditions in this country justified the introduction of airborne police on the lines of the proposed "flying branch" of the Canadian "Mounties," Sir Gifford Fox asked him how he could deal with smugglers who use aircraft if he had no flying police.

"The Home Secretary," says the P.A. report, "was understood to reply, amid laughter, that he would be very sorry to disclose to the criminal classes measures which existed to combat their activities."

The laughter very probably came from those honorable members who had listened-in the night before to the weekly item in the current B.B.C. series entitled "There's No Future in It," which, with the collaboration of New Scotland Yard officers, *is doing this very thing*—and doing it extremely well.

R.A.F. Leaving Dorval

R.A.F. Transport Command is to close down its station at Dorval, the Montreal airport, on February 15th.

In nearly six years of operations, this Canadian station was responsible for despatching thousands of bombers to bases in the United Kingdom and to the fighting fronts, but its staff has been undergoing a gradual reduction ever since VJ-Day until only a fraction of its wartime personnel now remains.

Dorval Airport, from which several Canadian domestic airlines are operating, will revert to the Canadian Department of Transport when the R.A.F. officially moves out to-morrow week; in practice, it may take a bit longer to complete the withdrawal and dispose of all the equipment.

Loyal Lizzie

A LYSANDER which had belonged to a Special Duties Squadron, and a veteran of many flights into occupied territory, was recently presented to France to mark the close bond that existed between the R.A.F. and the French Resistance Movement.

Viscount Stansgate, Secretary of State for Air, made the presentation in the courtyard of the *Cour d'Honneur des Invalides*, Paris, in the presence of French and British Service chiefs, former members of the Resistance Movement, pilots, members of the two Governments, and diplomatic officials.

The "Lizzie" belonged to a squadron which flew resistance workers to every occupied country in Europe, and took arms, ammunition and other vital supplies to the patriots there.

News in Brief

Mr. Jim Mollison's safe arrival in Brazil in the Percival Proctor he was delivering by air to a customer in that country was reported last week from Rio de Janeiro.

* * *

Jet aircraft designed to travel at five times the speed of sound (approximately 3,800 m.p.h.) and a rocket engine ten times larger than the type used in the V.2 were among projects being developed by the Germans, according to Canadian research experts who recently visited Germany, says a *Reuter* report from Ottawa.

* * *

An unusual flying hazard was encountered by a York aircraft on the first twice-a-week Springbok flight from South Africa to London. It ran into a heavy swarm of locusts near Nairobi and suffered damage to the radiators sufficient to cause the flight to be delayed until spares could arrive from South Africa.

* * *

A 64-page illustrated book entitled "The Story of the Air Training Corps" is being prepared by *The A.T.C. Gazette*, 1a, Pall Mall East, London, S.W.1, from whom copies may be ordered at 3s. including postage. The book deals with the past, present, and future of the Corps, and has a foreword by Lord Tedder.

* * *

Mr. F. McKenna, general manager and director of the Gloster Aircraft Co., is retiring owing to ill health, and the position will be filled by Mr. P. Crabbe, assistant general manager of Sir W. G. Armstrong-Whitworth Aircraft, Ltd. Mr. McKenna has been with Glosters for twenty-three and a half years, having started as production manager. He came originally from the Nieuport Aircraft Co., and has been connected with much of the high speed development in this country.

D

Disarming and Policing

OUR correspondent has just returned from a tour through the British occupied zone of Germany. During his visit he saw the work of disarming the Luftwaffe in progress, and visited the forward R.A.F. elements in Berlin.

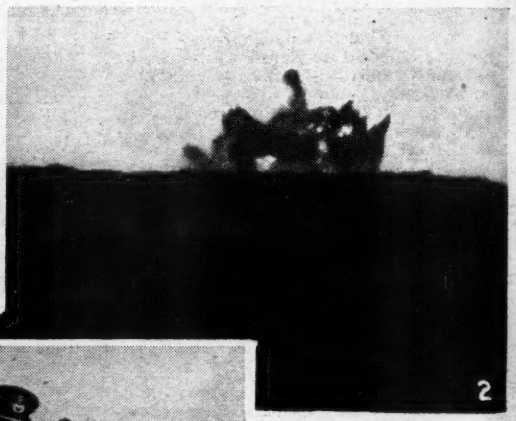
Work of the Royal Air Force on the Continent : The End of the Luftwaffe : Famous Squadron Now in Berlin

By JOHN YOXALL

INCLUDING the airmen on headquarters and other duties in the Berlin area the strength of the R.A.F. on the Continent is now in the region of 50,000 men. There are four Groups comprising some 28 squadrons:—No. 2 Group, Mosquitoes; No. 83 Group, Spitfires; No. 84 Group, Tempests; No. 85 Group, Maintenance and Training. Fighter Command also keep one squadron of night fighters on the Continent, but this is changed frequently.

Once a month Bomber Command send over training raids of about a hundred aircraft each, and the squadrons in Germany practise interception against them. These raids will shortly become even more realistic as it is intended to drop live bombs on Heligoland, which has been completely depopulated preparatory to its destruction.

The disarmament side of B.A.F.O. is made up of three specialised elements. One deals with the disposal of aircraft and materials, another handles the disbandment and control of *Luftwaffe* personnel, and the third section is responsible for the destruction of the anti-aircraft artillery. The staff



(1) One of the piles comprising 100 tons of bombs. The admixture of smoke and incendiary can be seen in the centre. The trees surrounding the site absorb a considerable proportion of the blast. (2) The explosion as viewed from about 1½ miles distant.

(3) A few seconds after the explosion a perfect mushroom formed with its head some 3,000 ft. high. (4) Group Captain T. Healey, A.A.F. (in sheepskin jacket) who is in charge of the disposal of armaments operations.

dealing with this last item is supplied by the Army, but the responsibility lies with the R.A.F. because the vast German *flak* organisation was an integral part of Goering's air force. Controlled by the Disarmament H.Q. at Bad Eilsen and Buckeburg are three groups, each with specialised staff and located at Celle, Schleswig and Gutersloh.

These Groups administer ten Wings totalling, in all, 33 squadrons, and each wing and squad-

ron is allocated a definite area of country which it is their responsibility to search. The Royal Canadian Air Force shares with the R.A.F. the work of air disarmament.

With the exception of bomb disposal, which is bound to take some time to complete, the disarmament work in the overrun countries is nearly finished. Most of the units have already been withdrawn.

In Germany, however, diligent search goes on without ceasing, but even here the progress has been such that most of the squadrons are now down to what is known as "square search." That is to say, all the big dumps and stores have been located and only a house-to-house search, map square by map square, remains to be carried out. Places where any equipment is found are known as targets and more than 6,000 of these targets have already been discovered.

Targets vary from complete factories and huge bomb dumps down to a few cases of parts or ammunition in isolated barns. It is the previous efficiency of our operational squadrons which is making our work so difficult to-day. The German is thorough in whatever he does—even in making mistakes—and this quality shows up in his continent-wide dispersal of material to avoid our air attacks. Near Celle, for instance, the Focke Wulf company had just started to put in an underground factory in a salt mine which had been out of use for the past eighteen years. Twenty rooms had been cut out and electric light installed. Some machinery was also in position. I was invited to visit this now empty plant, but cried off when I found that it meant being "hand wound" down 2,000ft. in an open steel bucket, only to see empty rooms by the light of a torch. More exciting was a visit to the Harth-Muna (bomb dump) in the Ringelstein Wald to see a hundred tons of bombs blown up in one glorious bang. On the face of it bomb destruction would appear to be a simple, if dangerous, job. Dangerous it certainly is. Eleven men have already lost their lives.

BRITISH AIR FORCES OF OCCUPATION

AIR COMMANDER IN-CHIEF
*Marshal of the R.A.F., Sir Sholto Douglas, G.C.B., M.C., D.F.C.**

- H.Q. Air Division — *Air Marshal Sir H. E. P. Wigglesworth, C.B., C.B.E., D.S.C.* (Detmold)
  - Forward Echelon of Air Division (B.E.), *Air Vice-Marshal Davidson, C.B.E.* (Berlin).
- 2 Group (Gütersloh)
- 83 Group (Schleswig)
- 84 Group (Celle)
- 85 Group (Hamburg)
- 103 Wing
- British Air Command, Berlin.* — *Air Comdre. H. W. Mermagen, C.B.E.*

* British Air Command, Berlin, should be regarded as a small Group H.Q. directly under the control of Air H.Q., B.A.F.O. It is responsible for the following :—

(i) Full operational and administrative control of all B.A.F.O. permanent forces (except Air Division, Control Commission) in the British Area of Berlin. Staff of the Air Division and any units or parts of units of the Disarmament (Executive) Branch come under British Air Command, Berlin, for day-to-day administration only. Their operational control remains with H.Q. Air Division and the head of the Disarmament (Executive) Branch of Air H.Q. (Ops.), B.A.F.O., respectively.

(ii) Day-to-day administration of all lodger units of other Commands or B.A.F.O. Groups.

(iii) Supervision of R.A.F. interests (other than those peculiar to the Air Division) in the British Area of Berlin.

* As we go to press it is announced that Sir Sholto Douglas has retired and is succeeded by Air Marshal Sir H. E. P. Wigglesworth. A. V.-M. Davidson becomes Dep.-Chief of Air Division.

Blowing-up Safely

There is, however, a good deal of technical and "know how" skill required before a hundred tons of bombs can be exploded safely. The position of the explosion in relation to earth contours and woodland belts is first considered, because even reverberation has been known to break windows as far as ten miles distant. The bombs must be piled into two heaps about 30 yards apart to split the earth

The Charlottenburger Chaussee in Berlin seen through an Opel windscreen. The Chaussee was used as an air strip during the time Berlin was invested. On the kerb are Russian soldiers. (Right) Passenger comfort on the Transport Command Run from Croydon to Germany.

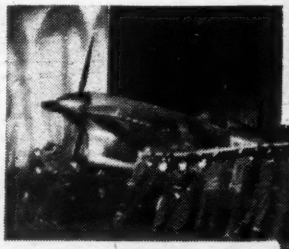
DISARMING AND POLICING

shock, and all fragmentation bombs put at the bottom of the piles. This avoids a shower of shrapnel descending on the countryside a few minutes after the explosion. Further, it is almost impossible to destroy smoke bombs on their own and a proportion of these is always put in with the high explosives.

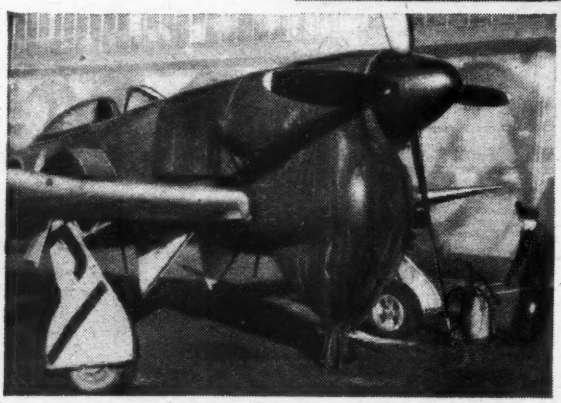
Necessary Precautions

In the heap destroyed at Harth-Muna there were 871 bombs, of which 650 were of the high-explosive type and the remainder smoke and incendiary. Above ground a hundred tons is about the limit for one explosion. Even so, the sirens are sounded in the neighbourhood, all windows have to be opened, the people must leave their houses, and observers must be under cover and some 1½ miles away. A special squad of military government labourers do nothing else but replace slates on the surrounding houses. Sometimes, according to the state of the weather, the blast bubble can be clearly seen, while at other times, in clear, cold weather, it is absent.

Below ground much bigger tonnages have been blown up. On one occasion eight hundred tons were blown and the earth shock was, of course, tremendous. The Harth-Muna follows a more or less standard pattern. All non-explosive equipment, such as tail fins, is stored in overground sheds, while all bombs, shells and so on are stored in tunnels cut into the hillsides to a depth of about a hundred metres. Each of these underground bunkers holds about four hundred tons of bombs. When the Germans retreated they left 21-day clock-timed bombs to destroy the store. Some of these blew up, and it is a long job making sure that a lot of dangerous material is not still underground. We have the plans and are carefully checking up. Of some 9,000-10,000 tons of bombs found here over half have already been destroyed.



(Below) A Tempest V of No. 33 Sqn. at Gatow, with its Sabre engine comfortably wrapped up to keep out the extreme cold.



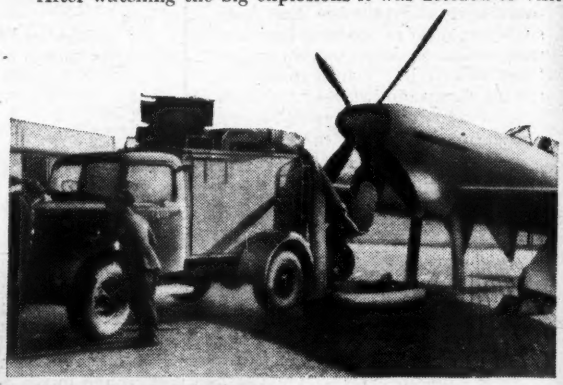
Pushing in the Tempests after the day's flying. On the right Sqn. Ldr. Bower, who commands No. 33 Squadron, is talking to Sqn. Ldr. John Mumford, who runs the very efficient Air Information Unit of B.A.F.O.

Altogether more than 100,000 tons of *Luftwaffe* explosives have been found in the British zone alone, and it is significant that 40,000 tons of these contained poison gas.

The demobilisation of *Luftwaffe* personnel is a big task in itself. Nearly half a million men have been disposed of to date. Special precautions are taken to make sure that discharged German technicians are not allowed to leave the country to join other air forces or to seek employment in any branch of the aircraft industry. Measures for controlling their activities are co-ordinated between the British, U.S. and French zones. About 20 per cent. have been absorbed into Service Groups (Dienst Gruppen) and are made to work as labourers on disarmament itself.

Originally they worked under their old officers and wore their service uniforms, but, following a complaint by Russia, they now wear a plain outfit similar to the British battledress and of an entirely non-military character. The cost of maintaining the Service Groups is borne by the German nation and the Germans provide altogether about 80 per cent. of the total man power employed in disarming the *Luftwaffe*.

After watching the big explosions it was decided to visit Berlin, and the C.-in-C., Sir Sholto Douglas, kindly lent one of the Dakotas from his communication flight for the journey. On the frozen airfield at Buckeburg the Dakota was covered with frost and a thin layer of snow. To clear this, and to prevent any further building-up in the air, the whole machine was sprayed with alcohol. In operational days in high latitudes this was done regularly every three hours to aircraft which might meet icing conditions.



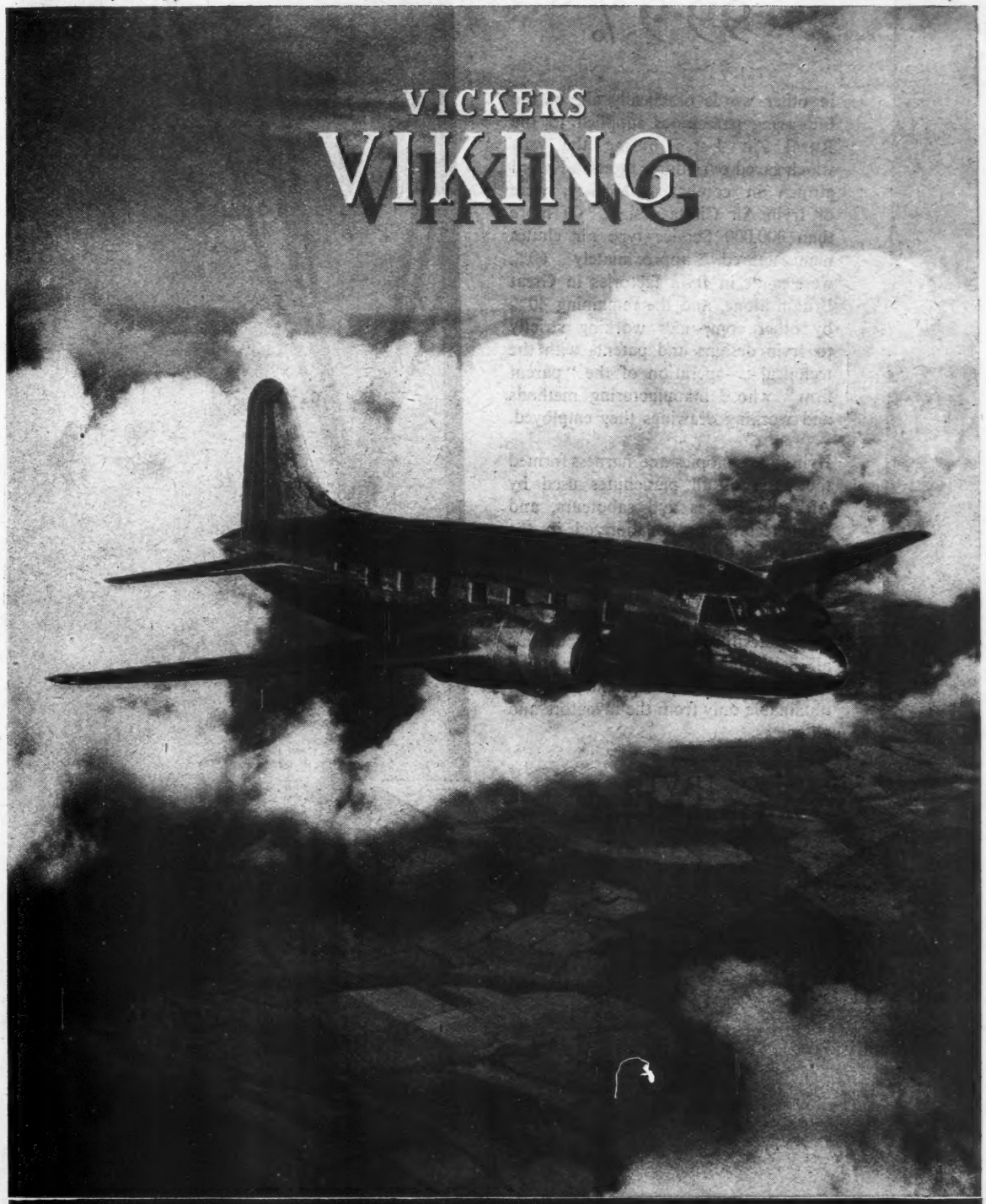
To ensure an easy start under cold conditions, hot air is pumped round the Napier Sabre engines to thin out the oil on the sleeves.

From the air, on this still, wintry morning, the ground looked exquisite. A slight mist hung in the valleys and the tops of the wooded hills peeped through, appearing to be sitting on clouds. The air was absolutely bumpless and, judging by the little smoke from the few operating factory chimneys, a slight drift of air from the south-east was apparent.

Slow Recovery

As we journeyed the 170 miles from Buckeburg to Berlin in lovely sunshine one could not forget that this quiet trip had been paid for in lives by the aircrews of the operational commands. How hazardous would a similar flight have been less than a year ago.

In comparison with the conditions last summer, Germany appears to be coming to life again—but very slowly. Those factories away from the towns, the railways and the public utilities begin to show signs of operation. Everything is in the grip of a hard frost—most of the rivers and lakes are frozen—and, apart from industrial requirements, the absence of fuel is almost equal as a hardship to the shortage of food. The Germans' inordinate love of



VICKERS-ARMSTRONGS
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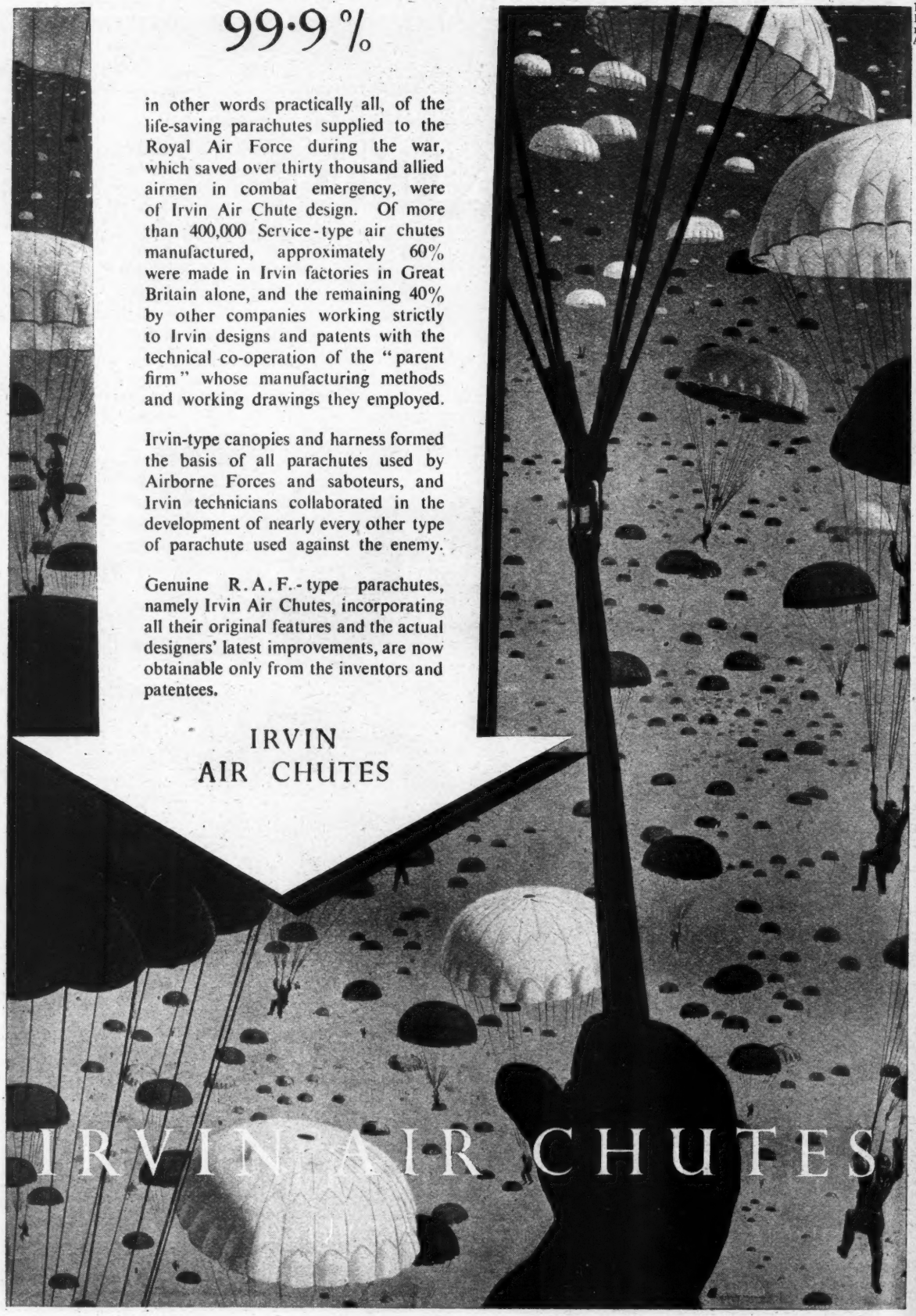
99·9%

in other words practically all, of the life-saving parachutes supplied to the Royal Air Force during the war, which saved over thirty thousand allied airmen in combat emergency, were of Irvin Air Chute design. Of more than 400,000 Service-type air chutes manufactured, approximately 60% were made in Irvin factories in Great Britain alone, and the remaining 40% by other companies working strictly to Irvin designs and patents with the technical co-operation of the "parent firm" whose manufacturing methods and working drawings they employed.

Irvin-type canopies and harness formed the basis of all parachutes used by Airborne Forces and saboteurs, and Irvin technicians collaborated in the development of nearly every other type of parachute used against the enemy.

Genuine R.A.F.-type parachutes, namely Irvin Air Chutes, incorporating all their original features and the actual designers' latest improvements, are now obtainable only from the inventors and patentees.

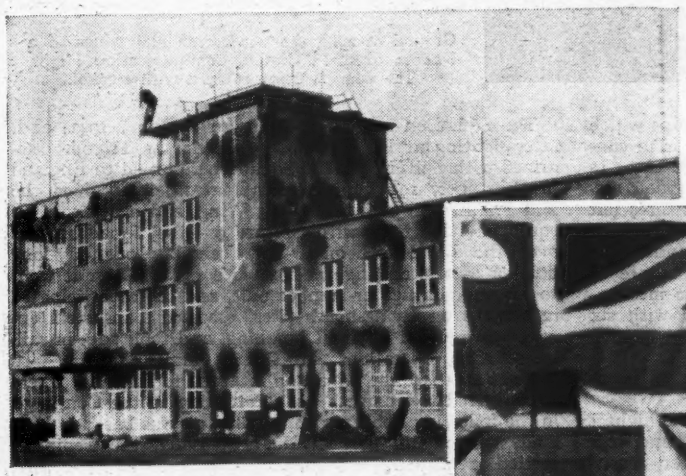
IRVIN
AIR CHUTES



DISARMING AND POLICING

planting trees is standing him in good stead now because, generally speaking, locally hewn wood is the only fuel available.

The Dakota crossed into the Russian zone at Helmstedt, which is about half-way on the journey. From here all aircraft other than Russian have to keep to a corridor some twenty miles wide. Trundling along at 3,500ft. we were soon on the outskirts of Berlin; we turned off south-east and descended to 1,200ft. to look at Potsdam—the home of militarism in Germany—and to do a low circuit over Berlin to see the state of the capital. The suburbs of the city look very much "fought over." Frozen bomb craters are everywhere, and the ruined condition of the city is just unbelievable. No smoke comes from the houses and very little traffic moves in the streets, although here and there a tram or bus pursues its overloaded way.



The exterior of Transport Command's staging post at Gatow, Berlin, and a German waitress serving refreshments in the buffet, in the shade of the Union Jack and the Red Flag.

Sharply defined down below are the trenches hastily dug by the Berliners in a vain effort to stem the Russian tide. These are smothered in craters of all sizes.

The circuit of the city completed, we landed at Gatow, which is the airfield allocated to the British in Berlin. It is some 12-14 miles from the city and very close to the Russian air base at Staaken. The landing on the steel runway in the frozen turf produced a swish scarcely distinguishable from the sound of a flying boat alighting on the water.

Russian Recce

The proximity of the Russians was evident from the moment of landing because one of the little U 2 (also known as the PO 2) biplanes with three-cylinder engines flapped its leisurely way overhead at about 1,000ft. This one comes over every day apparently, and is known by our people as the "look see" aircraft. As the U 2 disappeared in the distance a Yak flew down the runway at about 200ft. This was followed by another at a short interval. They are nice-looking aircraft, but it is doubtful whether they are in the same class as the Tempest. But then, as the Germans found to their cost, one must be very careful in the assessment of things Russian.

Gatow, the Staging Post, as it is called, of Transport Command, is very well run, but it is here that immediate contact is made with Berlin conditions as they are to-day. An obviously underfed German porter handles one baggage on the ground floor, and a plump German waitress serves tea and snacks to passengers on the first floor. Any job dealing with food is much sought after in Germany to-day. In Celle the waitress who served my lunch was the wife of a chief justice. In Berlin everyone becomes very food conscious. Either one has a reasonably full stomach and is ashamed of it, or one has a nearly empty one and will go to any lengths to fill it. Semi-starvation is rife on the small rations available, and personal treasures, even wedding rings, are sold to buy slices of bread at 10 marks a slice on the black market. To a German a mark is quite the equivalent of a shilling to us. Normally honest housewives are known to offer themselves for a few cigarettes. Not because they wanted to smoke, but because cigarettes fetch 7½ marks each on the black market and a few slices of bread can be bought in exchange.

Humane Treatment

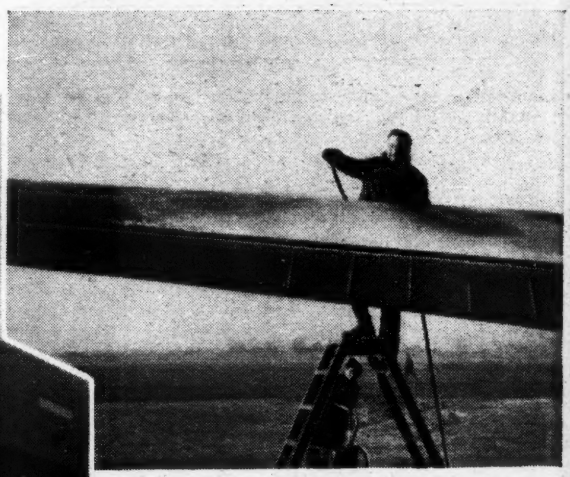
The countryside does not suffer to anything like the same degree, and the British "Operation Stork," taking the children away from the cities, was a great humane idea. The people cling to the rubble of this once great capital, but how it is ever going to support them again is difficult to imagine. Two-thirds of the people should be taken away and distributed equally over the countryside and made to work on the land which is starved of labour.

At a reception in the city I met Air Comdre. Mermagen, who is A.O.C. British Air Command (Berlin). He is the pilot who, as a flight lieutenant at C.F.S. in 1937, used to delight us with his inverted flying at the Hendon displays. I remember flying in an Anson on which he was to formate in the inverted position. His judgment was so perfect that, instead of half-rolling outward and then edging inward, he half-rolled inward, finishing up with his wing inside the Anson's span.

At the same reception I was fortunate in meeting a young Russian-speaking officer who had been attached for a long while to the Russian air force at the time when we let them have our sorely needed Hurricanes. To an enquiry as to how he got on with Russians he gave the reply which is given by anyone who has had contact with them. Difficult and "stand-offish" at first, they eventually open their hearts and are then wonderful comrades.

He told me also how the Russian air force has no stores in our sense, neither are there any arrangements for returning damaged aircraft to the makers for repair and over-

DISARMING AND POLICING



Ground de-icing the windscreen and wings of a Dakota of the C.-in-C.'s Communication Flight. The wing is being sprayed with alcohol.

haul. In its place they have regimental workshops which are expected to make all the necessary spares, or to cannibalise them from other aircraft. An extreme case, in illustration, was the adaptation of some Hampden airscrews of No. 455 Squadron to some of the Spitfires left behind by the P.R. flight which used to operate over the *Tirpitz* before it was sunk by Bomber Command. The Russians were very fond of their Hurricanes because of their sturdy build and easy maintenance. It is interesting to learn that our Allies were fitting them with six rockets, two 0.5in. machine guns and two 20 mm. cannon as early as March, 1942.

Russian Air Set-up

The Russians have no independent air force, the highest command being the equivalent of our Group, and this comes under the local General. There is, however, a central board in Moscow which co-ordinates army and naval aviation. Pilots were encouraged to perform individual sorties much in the manner of the Royal Flying Corps in the 1914--18 war, and it is true that pilots were paid a bonus of 200 roubles for every German aircraft shot down.

Very few of the four-engined T.B.7 bombers ever went into service, and these few were used mostly on transport duties. A radial-engined version of the Yak 9 or Il 2 is said to be in service and quite fast.

The R.A.F. keep one fighter squadron in the Berlin area to police the sector and show the flag. No. 33 Squadron, flying Tempest Vs, has just moved in to relieve No. 451 R.A.A.F. Squadron, who fly Spitfires. *Flight* has a proprietary interest in No. 33 Squadron. For years, while Lord Trenchard was C.A.S., Press visits to squadrons were forbidden. Many times we applied and many times we were turned down. Then at last, in 1930, permission was granted and we visited No. 33 squadron, which had just been re-equipped with the famous Hawker Hart which, for a short while, made the bomber faster than the fighter.

At the outbreak of war No. 33 Squadron, equipped with Gladiator fighters, was in Palestine and later moved to the Western Desert, where it took part in the first air battles against the much-vaunted Italian Air Force. The squadron was part of the slender air force which was sent to Greece with Wavell's "Desert Rats" to try to stem the German drive to Athens. Later it took part in the evacuation from Greece and succeeded in reaching Crete. It was at Maleme airfield that the squadron lost most of its Gladiators and Hurricanes and where, in a last gallant stand, the airmen drove off the enemy at bayonet point—the most stirring chapter in the Squadron's long and eventful history.

The Squadron re-formed in Egypt in June, 1941, and, after fighting at El Alamein, got as far as Tripoli. Rearmed with Spitfire Vs, the Squadron returned to England in December, 1943, from Mersa Matruh, and joined the 2nd T.A.F. As part of No. 135 Wing, and once again re-equipped—this time with Spitfire 9s—the Squadron was over the beachhead on D-Day carrying out day-long bomber escorts and fighter-bomber sorties. Later it went to France as a fighter-bomber unit, and there participated in attacks on flying-bomb sites, escorted Lancasters engaged on tactical daylight bombing, and took part in rail-interdiction operations in France and Belgium. In December, 1944, the Squadron returned to England, where it converted to Tempest Vs. Returning to the Continent in the following February, the Squadron was based in Holland, where, still part of No. 135 Wing, the Tempests carried out armed reconnaissance and fighter sweeps. Just before D-Day No. 33 Squadron became a fighter-bomber unit, the only Tempest Squadron in 84 Group to carry bombs.

Return to Silver

The Squadron had a score of over 300 enemy aircraft destroyed when VE-Day came. It is commanded by Sqn. Ldr. A. W. Bower, D.F.C., of Pretoria, S.A.

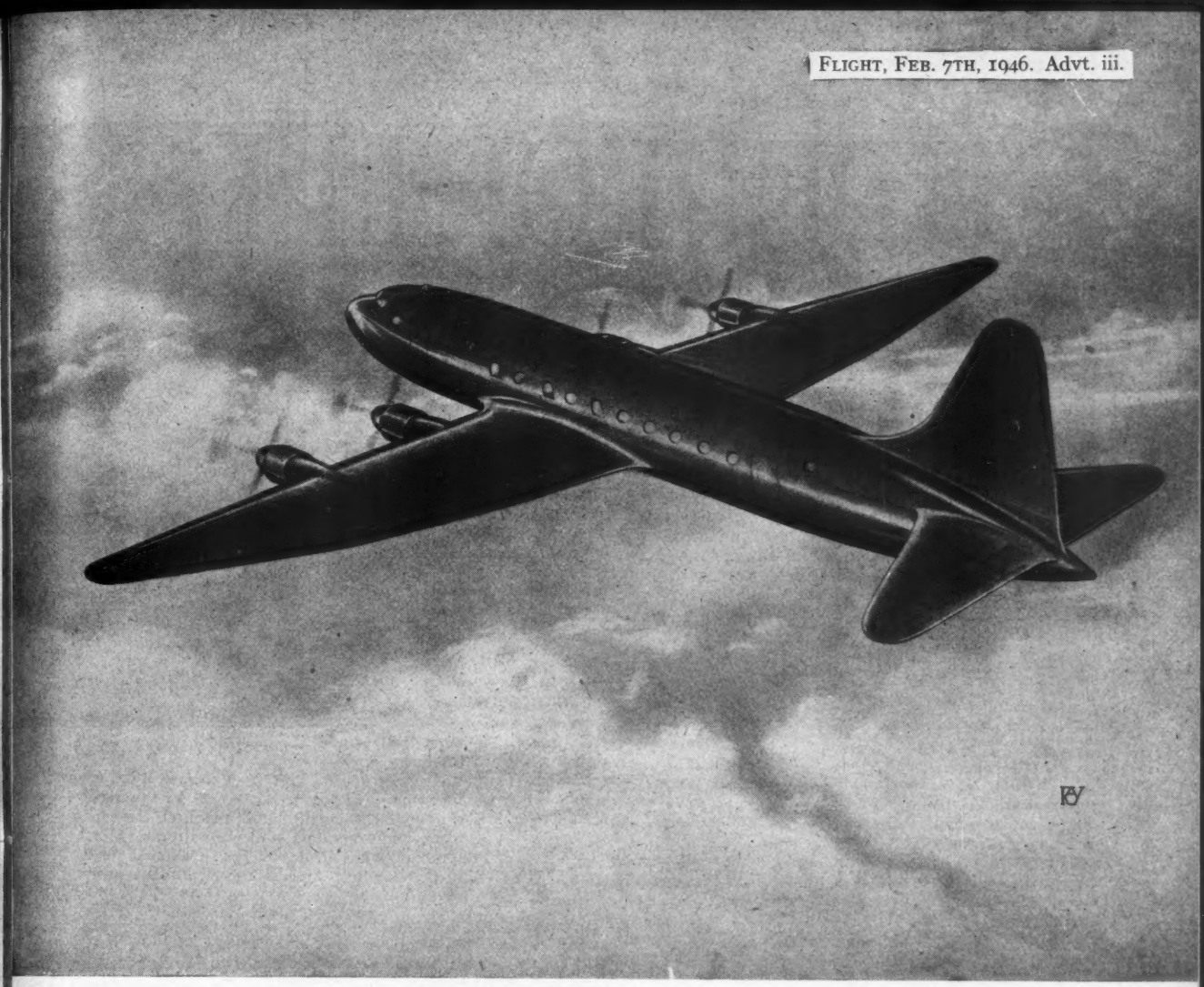
With them at Gatow is Corporal Derrick, who has been with the Squadron since war broke out. He is the only one to have remained with it for the whole period.

The Tempests are now very reliable, but with demobilisation at its peak the Squadron personnel are continually being replaced by men of less experience, and this has a considerable effect on serviceability of aircraft. At present they are busy removing the camouflage from their aircraft with paint remover and are burnishing the aluminium. It will be nice to see the peacetime silver finish again, and possibly performance will go up somewhat. At present they are only allowed +9 lb. boost instead of the wartime operational boost of +11 lb. Nevertheless, the Tempest still cruises at 310 m.p.h. at 2,000ft. and a duty flight to England only takes two hours.

I did not return quite as fast as this, but left Germany at midday in a Dakota and was sitting in my home in Surrey by 4.25 p.m. An hour is saved in the difference between Greenwich Mean Time and Continental time.

TURBINES & RECIPROCATING ENGINES COMPARED

FEBRUARY 21st issue of Flight will contain a four-page coloured supplement with a graphic description of the action of a gas turbine compared to a four-stroke reciprocating engine.



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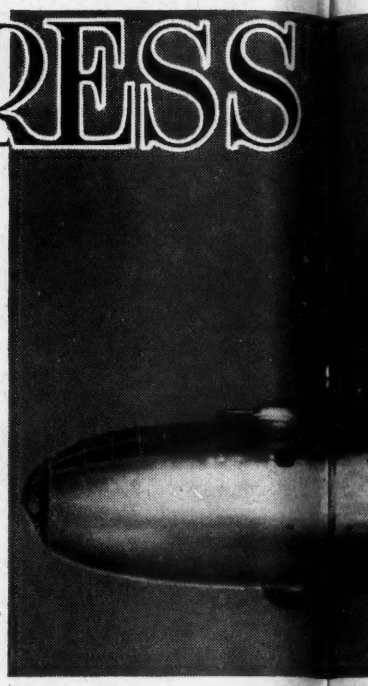
SUPERFORTRESS

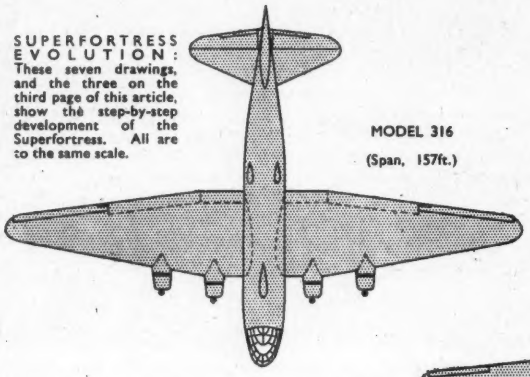
The Genealogy of a Notable Long-range Heavy Bomber

By JOHN W. R. TAYLOR

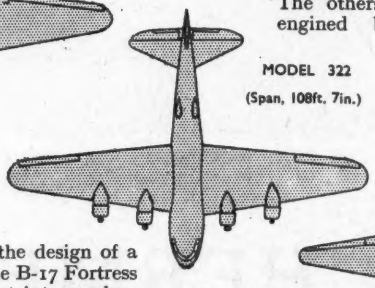


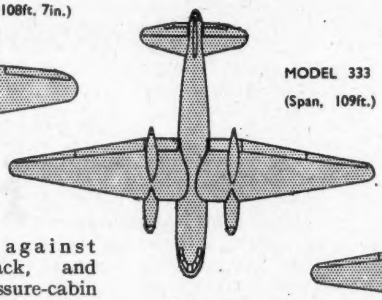
THE atom-bomb and its implications have formed a topic of world conversation for several months. But only brief mention has been made of the aircraft that delivered this terrible new weapon—the Boeing B-29 Superfortress. There is no doubt that the Superfortresses of the American 20th Bomber Command had begun to make the Japanese realise that war is not all fun and glory long before the first atom-bomb was dropped on Hiroshima. For many months hundreds of Superfortresses had flown out almost every day from the Mariannas, each to drop up to eight tons of bombs on the Japanese homeland.

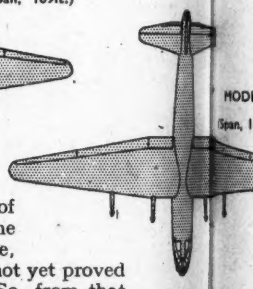
It was no mere accident, nor luck, that the U.S.A.A.F. had available, at the right moment, a bomber with a good enough performance, in particular range and load-carrying capacity, to make the long 14-hour round trips. As long ago as 1936 the Boeing staff began to work on the design of a bomber which was eventually to supersede the B-17 Fortress (Boeing Model 299), which had just been put into production. At first this development work merely took the form of designing "scaled-up" versions of the B-17 with increased performance and bomb-load, and little attention was paid to improving operational efficiency by cabin-pressurisation, more effective defensive armament or general cleaning-up of the airframe.



SUPERFORTRESS EVOLUTION: These seven drawings, and the three on the third page of this article, show the step-by-step development of the Superfortress. All are to the same scale.







The First Stepping-stone

The first result of this policy was the 87,600 lb. XB-15, which was built and delivered to the U.S.A.A.F. in 1937. This bomber was very similar in general appearance to the B-17, except for the sharp taper of its 157ft. span wing; it was fitted with four 1,000 h.p. Pratt and Whitney Twin Wasp engines, as the 2,000 h.p. engines for which it was designed were not available. Unfortunately these were not powerful enough to give the XB-15 a very high performance, and its top speed of 200 m.p.h., its rate-of-climb and operational ceiling were all inferior to those of the B-17. Nevertheless, the XB-15 was the first stepping-stone to the B-29, and provided much valuable experience in the design of large bombers. It served with distinction as a transport with the American Transport Command during the war, one of its jobs being to fly relief supplies to the victims of the Chilean earthquake.

By 1938 the American War Department was beginning to conceive something entirely new in the way of a heavy bomber. It believed that, to achieve any degree of accuracy, bombing would have to be done in daylight. This, of course, meant that means of defence for the bomber became a prime consideration, because it was no use having bombers that could carry the heaviest bomb-load of any aircraft if they were not coming back from their missions. As in Britain at that time, there were two schools of thought on this business of bomber defence. The first believed that the best defence any bomber could have was speed, and they argued that a small, fast bomber—more or less a big bomb with wings and two powerful engines—would have the best chance against enemy fighters and anti-aircraft fire. The others were in favour of a large four-engined bomber, formidably armed and armoured against fighter attack, and with a pressure-cabin to enable it to fly high enough to be out of range of all but the heaviest guns. The American love of big things decided the issue, and, anyway, at that time the Mosquito had not yet proved the soundness of the first line of thought. So, from that moment, work on heavy bomber design was speeded-up in several American plants, particularly at Boeings.

Meanwhile the engine manufacturers were keeping pace with the airframe companies, and the prototype, 2,200 h.p. 18-cylinder Wright Cyclone had been built. It was given its first test at Wright Field on June 29th, 1938, and the results proved so promising that development work on the engine proceeded simultaneously with airframe design development.

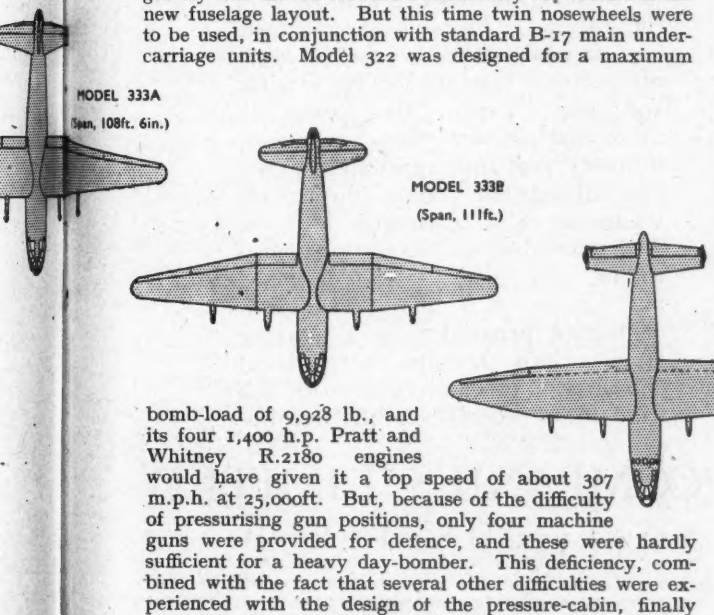
In an effort to satisfy the new War Department requirements Boeings worked out the design of a high-wing pressure-cabin version of the XB-15, known as Model 316. This project differed considerably from the original XB-15, and it was intended to fit four of the new 2,000 h.p. Wright R-3350 engines. A point of great interest was the provision for a tricycle undercarriage, the first Boeing design

S DEVELOPMENT

The B-29 has a wing span of 141ft. 3in. and an overall length of 99ft. It carries a much greater bomb-load than its predecessors, viz., 20,000 lb.

to incorporate this feature. It was realised that very large main wheels would be needed to support the 89,900 lb. of the project, and it would have been impossible completely to retract them into the engine nacelles. Consequently each main undercarriage leg was designed with two proportionally smaller wheels, which could be accommodated in the nacelles.

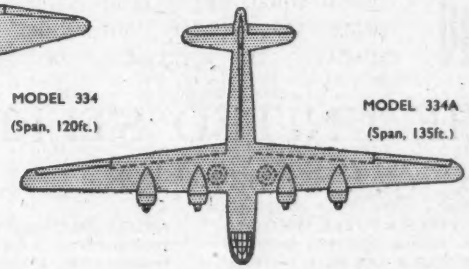
Meanwhile the Army Air Forces asked Boeings to submit plans for pressurising the cabin of the B-17 Flying Fortress. This project—Model 322—used standard B-17 wings, engines and tail unit, but had a large-diameter, circular fuselage to facilitate pressurisation. Once again it was decided to use a tricycle undercarriage, as the centre of gravity had moved forward considerably as a result of the new fuselage layout. But this time twin nosewheels were to be used, in conjunction with standard B-17 main undercarriage units. Model 322 was designed for a maximum bomb-load of 9,928 lb., and its four 1,400 h.p. Pratt and Whitney R.2180 engines would have given it a top speed of about 307 m.p.h. at 25,000ft. But, because of the difficulty of pressurising gun positions, only four machine guns were provided for defence, and these were hardly sufficient for a heavy day-bomber. This deficiency, combined with the fact that several other difficulties were experienced with the design of the pressure-cabin, finally compelled Boeings to tell the U.S.A.A.F. that the pressurised B-17 was not considered a practical proposition.



But, at last, Boeings knew just what sort of heavy bomber the War Department was after, so they set to work with renewed enthusiasm to produce a bomber that would be entirely new and revolutionary, and not just a re-hash of an existing type. They were not at that time concerned with producing a bigger bomber than the B-17, or even in increasing bomb-load. All they wanted was a pressurised bomber with a good performance high up.

For the first time they decided to use liquid-cooled, in-line engines. Allisons had just produced their new 1,150 h.p. V-1710 engine—America's first attempt at producing a modern high-powered, in-line engine. Without any air-cooling worries to think about, Boeings went all-out on cleanliness of design and mounted the four Allisons in tandem pairs on the new Model 333. In fact, this project had cleaner lines than anything before conceived and seemed quite promising. A single-wheeled tricycle undercarriage was called for, and for the first time a tail machine-gun position was introduced. But perhaps the most significant feature of Model 333 was the fact that the pressurised sections of the fuselage were connected by a crew communication tunnel of small diameter—a feature that remained unchanged through all the succeeding projects, and is still standard on the B-29.

The advantages of the tandem engine installation were, however, questionable, and so this design gave way to Model 333A. This was identical in almost every respect



Painting by Anna Zinkeisen

This Present Age . . 10

Modern civilisation is a complex structure of human organisms in differing combinations, each contributing some indispensable function to the whole. As with every living thing it is subject to many diseases of known and unknown origin. The minds and genius of men must be dedicated to the total elimination of these through the greater study of humanity itself. The foundations of a healthy social state can be laid on this basis by ensuring that the constitution is organically sound. It is a fundamental principle of democracy that all men are created equal, but it is also a law of nature that all are not equal in capacity. An appreciation of these factors imposes a duty on the individual to contribute, to the limit of his powers, towards the well-being of the nation. Each citizen therefore, has a vital stake in the shaping of destinies that cannot be evaded, and must acquire the power to think and act with that characteristic honesty and independence which has imbued our nation throughout its great and glorious history. The maximum productive potential within our industry is desirable, but outside, it is the development of human personality as a dynamic force, which remains a personal obligation to procure the liberties and freedoms of progressive social reform.

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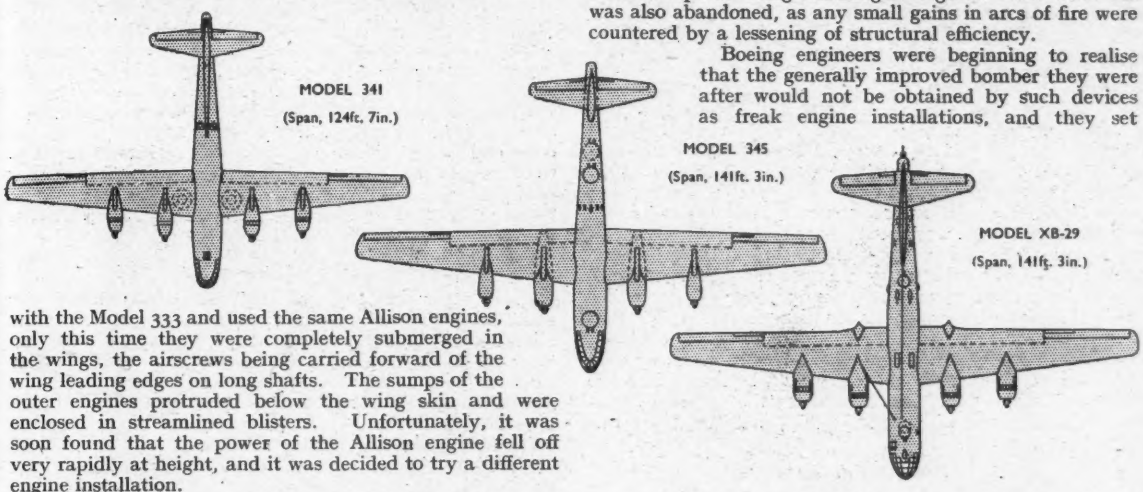
SUPERFORTRESS DEVELOPMENT



with the Model 333 and used the same Allison engines, only this time they were completely submerged in the wings, the airscrews being carried forward of the wing leading edges on long shafts. The sumps of the outer engines protruded below the wing skin and were enclosed in streamlined blisters. Unfortunately, it was soon found that the power of the Allison engine fell off very rapidly at height, and it was decided to try a different engine installation.

Both the Wright and Pratt and Whitney engine companies were working on the development of "flat" type engines that could be completely submerged in the wings of large aircraft, and so Boeings designed a project for each engine. Model 333B used four 1,850 h.p. Wright 1800 engines and had an airframe identical with that of the Model 333A. The larger engines put the estimated loaded weight up to 52,180 lb. and gave a top speed of 364 m.p.h. at 20,000ft. Unfortunately, Model 333B had an estimated range of only 2,500 miles with one ton of bombs, as the submerged engines took up space normally used for fuel tanks. As America has always been "Pacific war-minded," where distances are great, a range of 2,500 miles was hardly sufficient for a heavy bomber.

Submerged Engines Unsuccessful

The project with Pratt and Whitney 1800 "flat" engines —Model 334—was basically similar to Model 333B, but the wing was redesigned to increase fuel capacity, and this type had an estimated range of 4,500 miles. By this time, March, 1939, European air forces were being re-equipped with new and deadly monoplane fighters, the Hurricane and Spitfire with eight machine-guns, and the Messerschmitt 109 with cannons and machine-guns, being outstanding. Consequently, the question of defensive armament became of prime importance, and Model 334 was designed with twin fins and rudders in an effort to improve the arc of fire of its eight machine-guns. This further enhanced the already-clean lines of the fuselage and, combined with the improved efficiency of the wing, permitted an increase in bomb-load of one ton (to 7,830 lb.) and put the estimated top speed up to 390 m.p.h. at 20,000ft. It was found, however, that the completely submerged flat engines did not improve aerodynamic efficiency sufficiently to justify the consequent reduction in fuel storage space and complication of wing structure, and so Model 334 was Boeing's last attempt at using submerged engines. The twin tail was also abandoned, as any small gains in arcs of fire were countered by a lessening of structural efficiency.

Boeing engineers were beginning to realise that the generally improved bomber they were after would not be obtained by such devices as freak engine installations, and they set to work developing instead a new aerofoil that would give greatly improved all-round efficiency. The prototype Consolidated XB-24 Liberator, with its high-aspect ratio Davis wing, must have helped to convince them that this was the wisest policy to pursue, and the next project had a wing very reminiscent of that on the XB-24. Also, as in the XB-24, the main wheels of the tricycle undercarriage were now designed to fold sideways into the wings instead of into the nacelles.

The project designed around the new wing was designated Model 334A, but it was such a radical redesign that it should really have borne a new Model series number. It was the first "blood ancestor" of the present Superfortress, with a high single fin and rudder and a long dorsal fin. By this time the Wright 3350 engine was coming along well, and so Boeings decided to use four of these engines on the new project. It was obvious that production engines would develop over 2,000 h.p., and it was estimated that the project would have a speed of 390 m.p.h. at 16,000ft. and a useful 5,333 miles' range. The years of painstaking development work were beginning to show results and, although Model 334A was not built, Boeings knew that they were working on the right lines.

Late in 1939 the U.S.A.A.F. asked several aircraft companies to submit designs for a larger long-range bomber, indicating minimum requirements for performance, load-carrying capacity, weight, range and armament. This was put out in the form of a formal specification in January, 1940. The first few months of the war in Europe had been sufficient to convince the U.S.A.A.F. that their existing bombers and fighters were hopelessly out of date, and consequently Boeings were given plenty of encouragement in developing their heavy bomber designs.

The Aerodynamics Unit was still busy developing im-

DATA ON THE SUPERFORTRESS TYPES.

Project Type No.	Engines	Wing Span	Length	Gross Wt.	Wing Loading	Range with 2,000 lb. Bombs	Maximum Speed	Max. Bomb Load
		ft. in.	ft. in.	lb.	lb./sq. ft.	miles.		lb.
MODEL 316 (March, 1938) ...	2,000 h.p. Wright R-3350 ...	157 0	109 2	89,900	31	4,000	248 m.p.h. at 15,000 ft.	—
MODEL 322 (June, 1938) ...	1,400 h.p. Pratt & Whitney R2180	108 7	75 5	53,100	35	3,600	307 m.p.h. at 25,000 ft.	9,928
MODEL 333 (Jan. 26, 1939) ...	1,150 h.p. Allison 1710 ...	109 0	80 8	48,600	34	3,420	307 m.p.h. at 15,000ft.	5,800
MODEL 333A (Jan. 27, 1939) ...	1,150 h.p. Allison 1710 ...	108 6	80 8	48,600	34	3,000	328 m.p.h. at 15,000ft.	5,800
MODEL 333B (Feb. 21, 1939) ...	1,850 h.p. Wright 1800 ...	111 0	80 8	52,180	34	2,500	364 m.p.h. at 20,000ft.	5,800
MODEL 334 (March 4, 1939) ...	1,850 h.p. Pratt & Whitney 1800	120 0	83 4	66,000	40	4,500	390 m.p.h. at 20,000ft.	7,830
MODEL 334A (July, 1939) ...	2,200 h.p. Wright 3350 ...	135 0	80 0	66,000	47	5,333	390 m.p.h. at 16,000ft.	7,830
MODEL 341 (Aug., 1939–Mar., 1940)	2,000 h.p. Pratt & Whitney R-2800	124 7	85 6	85,672	64	7,000	405 m.p.h. at 25,000ft.	10,000
MODEL 345 (March–April, 1940)	2,200 h.p. Wright R-3350 ...	141 3	93 0	112,300	65	6,950	382 m.p.h. at 25,000ft.	16,000
†XB-29 (June, 1940–Feb., 1942) ...	2,200 h.p. Wright R-3350 ...	141 3	98 2	114,500	66	5,333	382 m.p.h. at 25,000ft.	20,000
* B-29 (July, 1943)	2,200 h.p. Wright R-3350 ...	141 3	99 0	135,000	77	Re-stricted	Over 350 m.p.h.	20,000

The dates given are those on which preliminary design drawings were completed, with the exception of :—
† Date of development of prototype.
* Date of first flight.

SUPERFORTRESS DEVELOPMENT

proved high-lift aerofoils. It had drawn up the preliminary design of a new 124ft. 7in. span wing of very high aspect ratio, using an aerofoil that gave better results than any previously designed for a bomber. Boeing Model 341, powered by four 2,000 h.p. Pratt and Whitney R-2800 engines, was designed to use this wing and was radically different from anything previously developed, although its fuselage lines bore a "family likeness" to Model 334A. Model 341 had a greatly improved estimated performance over any of the previous designs and, although its loaded weight of 85,672 lb. was about 30 per cent. greater than that of Model 334A, it was 15 m.p.h. faster, had a 1,700-mile better range and could carry a 25 per cent. greater bomb-load. In the first three months of 1940 Boeings submitted several progressive proposals on this model to the War Department and appeared almost certain of a contract. But once again their luck was out. It was obviously only a matter of time before America would be forced into the war, and so the U.S.A.A.F. increased the size and armament requirements of its specification, and Model 341 was out of the running.

Success at Last

For the next two months the Boeing design staff worked furiously on the new specification and, on May 11th, submitted to Wright Field the preliminary designs of Model 345—an enlarged version of Model 341, with revised armament. This was quickly accepted by U.S.A.A.F. representatives as being the type desired, and on June 14th, the day on which Paris fell to the Germans, Boeings were authorised to prepare additional aerodynamic data on the machine. Shortly afterwards a contract was awarded, covering the construction of several prototypes, to be designated XB-29.

Model 345 was a mid-wing monoplane with a pressure-cabin and was designed for four Wright R-3350 engines. It retained most of the design features of Model 341, including the new wing, with its "Boeing 117" aerofoil. It had a double-wheeled tricycle undercarriage, but the main wheels retracted into the inboard nacelles instead of into the wing, as in previous models. The gross weight went up to 112,300 lb. and the bomb-load to eight American tons. But the biggest advance of all was made in defensive armament. Model 341 had had only six 0.50in. manually operated guns; Model 345 had ten 0.50in. guns, and one 20 mm. cannon mounted in the tail. The machine-guns were mounted in pairs in four Sperry retractable turrets and one power-operated tail turret. The problem of pressurising the gun positions was tackled in an entirely new way, and instead of the gunners sitting inside each turret, they controlled the guns remotely from easily pressurised compartments inside the fuselage, sighting through periscopes.

Towards the end of 1940 a full-size wooden mock-up of the XB-29 was built and inspected by U.S.A.A.F. technicians. At the same time wind-tunnel testing of detailed scaled-down sections was started. Meanwhile the Wright engine had been accepted for production by the American Material Command, and so Boeings were able to start detail design work on the nacelles and mountings for this engine. This was not as easy as it sounds. The aerodynamics people had conceived a beautifully clean nacelle, offering a minimum of head resistance; the project engineers realised that the nacelles would have to house two turbo-superchargers for each engine, inter-coolers and the main undercarriage legs and wheels, as well as the engines themselves. Clay models were made and tested for more than a year before a compromise was finally arrived at, and as a result it is claimed that more air is drawn through B-29 nacelles than any others of their size.

Control Research

Every other component of the XB-29 was designed with equal care. To reduce pilot fatigue on long flights, great attention was paid to ease of control, and all movable surfaces were tested thoroughly in the wind tunnel before being accepted. New aerofoil sections were evolved and special automatic control tabs built, which ensured that operation of the control surfaces required no more effort than those on much smaller aircraft. Pilots report very favourably on the B-29. The large fin ensures directional and lateral stability even under the extremely adverse condition of two engine failures on the same side at take-off.

The bomb-bay of the XB-29 was originally designed to accommodate a number of large bombs. By redesigning it, Boeing engineers made it capable of accommodating an equal weight of smaller, more bulky bombs, and at the same time increased the bomb-load to ten American tons. The armament was changed from the Sperry retractable to the Sperry non-retractable type of turret, and the inboard portion of the wing trailing edge was redesigned to improve the flap characteristics. Apart from these features, however, the prototype XB-29 was almost identical with the original Model 345 design.

First Prototype Flight

On September 21st, 1942, the prototype took off for the first time, in the hands of Eddie Allen, Boeing's chief test pilot (since dead). It bore out its designers' hopes in every respect and was put into production in the greatest manufacturing programme ever devoted to a single aircraft type. Four major companies—Boeing, Martin, Bell and Fisher—operating six of the largest aircraft plants in America, were ordered to build the airframes. The engines were to be built by Wrights and Dodge, the latter company operating the largest single-unit manufacturing plant in America.

The principal changes made for production were the use of General Electric turrets, sighted from "astro-domes," instead of the Sperry periscopically sighted type, and the fitting of four-bladed airscrews. The loaded weight has increased a further 20,000 lb. to 135,000 lb., but the production machines can still fly at over 350 m.p.h. and have a range of over 4,000 miles with some bombs.

HIGH PERFORMANCE

DETAILS have recently been released of an inverted 12-cylinder liquid-cooled aircraft engine developed by the Continental Aviation and Engineering Corp. of Detroit, which passed its tests in August, 1944, and for which unusually good performance figures are claimed.

This turbo-supercharged engine, known as the I-1430 "Hyper," is said to develop 2,100 h.p. for a weight of only 1,645 lb., which gives a power/weight ratio of only 0.783 lb./h.p. The actual dimensions of the engine are not stated, but it is said to produce no less than 1.5 h.p./cu. in. and to have a maximum diameter of only 32 in.

Twenty-three of these engines were delivered to the U.S.A.A.F. and some were experimentally installed in (among others) the Lockheed XP-49 and the McDonnell XP-67, and in spite of their success it was decided not to put the type into large-scale production but to incorporate as many of its outstanding characteristics as possible into engines already in production. Improvements in fuels made this engine development possible, say the makers.

ILIFFE PUBLICATIONS ON SHOW

THE Exhibition of Scientific and Engineering Inspection Equipment, held under the auspices of the National Trades Technical Societies, opens in Newcastle next Tuesday, February 12th, and it is hoped that readers will take the opportunity of examining the many Iliffe publications which will be on display there.

This exhibition, which is under the direction of Mr. D. M. Slorach, M.I.E.I., and appeals particularly to technical students and workers, is open from 3 p.m. on the first day, and then daily between 11 a.m. and 8 p.m. (Saturday 7 p.m.) until Friday, February 22nd. It is being staged at the Northumberland Road Drill Hall, Newcastle-on-Tyne, and some 40 firms are participating.

Many Iliffe journals and technical and trade reference books will be found at the *Associated Iliffe Press* Stand, No. 27, with a special show of *Machine Shop Magazine, Welding, Iron & Steel, British Engineering Export Journal, Wireless World, Wireless Engineer, Electrical Review, Aircraft Production, Automobile Engineer, British Plastics* and *Flight*.

CIVIL AVIATION

Empire and Atlantic

Details of Future B.O.A.C. Services : Three New Main Lines : Increased Frequency and Speed

WITH the final clarification of the Government's plans for British civil air services, B.O.A.C. have been able to explain in detail their long-range ideas for the immediate and less immediate future. In general, these follow the set programme of the old Imperial Airways, but there are three services in the new programme which can be considered as being "new"—a direct Atlantic service to New York; one to West Africa; and one to the Far East.

No firm dates can yet be given for the opening of these new services or for the eventual increases in frequency on the better-known runs, since the future depends so much on the availability of the "intermediate" types now in process of development and production, on the progress of the plain "brick and mortar" work still necessary both in this country and at the various staging posts on the Empire routes, and on the training of aircraft crews.

In brief, the proposals covering the coming six to twelve months are as follows: (1) the re-introduction of a sesvice to Australia and New Zealand by way of India, which will be operated at first four times a week to Australia and once to New Zealand, with an eventual frequency increase to seven and two respectively. (2) A service to India by way of the Middle East, with an immediate frequency of seven a week from the start and an ultimate frequency of ten services each way. (3) An increase in the frequency of the now weekly service to South Africa to six a week. (4) Two daily Atlantic services across the Atlantic from Heathrow—one to New York and another to Montreal; the frequency on these runs will be doubled as soon as possible—making a total of 28 services weekly from the United Kingdom to the North American continent. (5) Three services a week, with a possible increase to four, to Accra and Lagos in West Africa, via Algiers. (6) A 9,000-mile service to Hanoi (Indo-China), Hong Kong, Shanghai and Tokio, by way of Vienna and the Middle East.

In addition, plans are in process of development for the establishment of a joint trans-Pacific service, in which B.O.A.C. may share, between Canada, Australia and New Zealand, via San Francisco, Honolulu, Fiji and New Caledonia.

Tentative fares for the various services have been given by B.O.A.C., but, since these are liable to be modified by agreement with the International Air Traffic Association and will undoubtedly be reduced in due course, they must be treated as being approximate. During the initial period, at least, the fares will be very similar to those charged by operators of surface transport. For comparative interest these provisional fares are given in the accompanying table. At present the B.O.A.C. fares are those which have been charged on wartime services, and are anything from 25 to 100 per cent. above pre-war standards. They have been, and are still, dictated by the Treasury and cannot be considered as "commercial." B.O.A.C.'s intention is to bring the fares down first of all to figures comparable with those for first-class surface transport and, ultimately, to lower-than-pre-war levels.

B.O.A.C. MAIN LINES

SERVICE (Provisional Fares in brackets)	INCLUSIVE TIME OUT hr. min	INCLUSIVE TIME HOME hr. min.	EVENTUAL FREQUENCY per week
1. ("KANGAROO") LONDON — ROME — CAIRO — BASRA — KARACHI — CALCUTTA — RANGOON — SINGAPORE (£163) — SOURABAYA — CLONCURRY — SYDNEY (£220)— AUCKLAND (£240)	85.40	88.50	7 2
2. ("TIGER") LONDON — ROME — CAIRO — BAGHDAD — BASRA — KARACHI (£106)	27.20	31.20	10
3. ("SPRINGBOK") LONDON—MALTA — CAIRO — KHARTOUM — NAIROBI (£112) — UNNAMED — JOHANNESBURG (£131)	53.55	39.50	6
4. LONDON — GANDER — NEW YORK (£100)	23.00	17.00	14
LONDON — GANDER — MONTREAL ... (Some services via RINEANNA or PRESTWICK : Alternative "weather" routes via ICELAND or AZORES).			14
5. LONDON — ALGIERS (£31) — UNNAMED — KANO (£75) — ACCRA/LAGOS (£81)...	—	—	3
6. ("DRAGON") LONDON — VIENNA (£22) — LYDDA (£39) — BASRA — KARACHI (£106) — CALCUTTA (£119) — HANOI (£144) — HONGKONG (£156) — SHANGHAI (£169)—TOKYO (£187) ... (Connecting at Hongkong with local circular route : MANILA — SARAWAK — SINGAPORE—PENANG—BANGKOK).	59.10	62.15	4

Expected Starting Dates

The actual dates for the service extensions and multiplications depend, as previously explained, on aircraft availability, but it is reasonable to suppose that, in addition to the separate European (outlined in last week's issue) and South American services, which will be started within the next month, all but the double Atlantic and Far Eastern services will be in operation before the end of the summer. The daily Atlantic run will no doubt be possible as soon as the five Constellations have been delivered in the early summer, and no doubt the promised frequency increase will be possible when the Tudor Is come into use. The Far Eastern service may need to await the arrival of the Tudor IIs and the maximum frequency on the Australian run is likely only when Qantas have taken delivery of similar aircraft and are able to complete the regular run "in parallel."

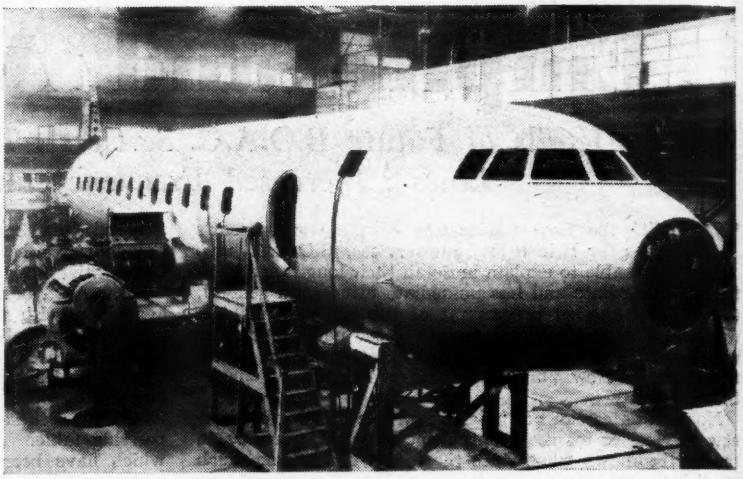
It may not be generally remembered that B.O.A.C. has never been a truly civil airline operator. The Corporation was actually formed, as a combination of British Airways and Imperial Airways, in April, 1940, and since then has been operating as a servant of the Government, flying on those routes which had to be kept open and using the aircraft it was told to use. Nevertheless, the Corporation has, during the war, been virtually pioneering in its natural field of operations. B.O.A.C. ran the first—and at that time the only—regular service across the North Atlantic for the benefit of returning ferry pilots and V.I.P.s. The direct West African service was also started during the war, as well as services to Persia and Abyssinia, Turkey and Southern Arabia, while the trans-Africa run from West Africa run to Khartoum was of vital importance after the Mediterranean had been cut off. Finally, and most interesting of all, has been the 12,000-mile 63-hour Lancastrian run to Australia with only three intermediate stops; this has been the longest and fastest air service operated anywhere in the world.

In the future, as part of a long-term policy, B.O.A.C. will have three types of service on the main routes: Medium-stage runs of 900-1,500 miles for less urgent passengers and goods and for the benefit of intermediate traffic; long-stage services with 2,000-mile stages for all through passengers and mail; and, eventually, a medium-stage, cheap-fare, mass-travel series of services. Presumably passengers will be charged an "express" supplement on all the long-stage services in order to balance the necessarily higher cost of operation.

It has usually been considered, particularly by American operators, that B.O.A.C. has made something of a fetish

EMPIRE AND ATLANTIC

of luxury in air travel. In point of fact, as Lord Knollys explained at a recent Press conference, the Corporation believes in the principle of planning a standard of comfort to suit the length of the stages. Obviously, it would be stupid in the extreme to carry passengers, say, to Australia in an extraordinary short time if the "non-stop" conditions in the aircraft were such that these passengers afterwards required a couple of days or more of rest in order to recuperate after the rigours of the journey. In such circumstances it would obviously be more economical, both for the passengers and for the operator, to make the journey in shorter stages with overnight stops. It is the Corporation's policy to offer sleeper accommodation for all services on which two or more nights may be spent by passengers in the same aircraft. As a matter of interest, the Atlantic runs involve a matter of 15-25 hours' almost continuous flying—depending on the route chosen—and this service is, therefore, a "seater" case. Presumably the Constellations will, in fact, be "seaters," while the Tudor Is may be "sleepers."



EMPIRE TRANSPORT: Taking shape now at Woodford is the prototype Tudor II for medium-range Empire runs.

For certain types of freight air transport may eventually offer considerable advantages, and B.O.A.C. is taking a considerable interest in the possibilities of extensive freight-carrying. The Corporation has, in fact, worked out provisional rates. Two main categories are envisaged: (1) Urgent goods for which space must be booked and carriage guaranteed; (2) rather less urgent goods which will not suffer if held up for a maximum of 48 hours. For the first of these B.O.A.C. contemplates a figure of 1s. 6d./lb./1,000 miles and for the second 9d./lb./1,000 miles. As a matter of further "costing" interest, the provisional fare for the New York run works out, treating the distance as 4,000 miles, at about 6d. a passenger/mile.

NEW PERCIVAL TWIN

NOT unnaturally, Percival Aircraft are, we hear, going ahead with the development of a twin-engined medium-sized aircraft to follow, in chronological sequence, the pre-war Q-6. The Merganser, as it will be called, will be an all-metal, high-wing six-seven seater with a tricycle undercarriage and powered by two Gipsy Queen 51 engines. Provisional estimates give a maximum speed of 194 m.p.h. at 5,000 feet.

TRANSJORDAN OPERATIONS

AN operating company known as the Arab Airways Association has been formed at Amman, Transjordan, for training, feeder-line and charter flying work, with the Transjordan Government's support. Four D.H. Rapide IIIs have been ordered and an entirely British technical staff is being built up. The staff-forming headquarters of the concern are at 13, Dam Street, Lichfield, Staffs.

GRUMMAN GOOSE REPLACEMENT

A NEW amphibian, the Mallard, is being developed by Grumman Aircraft to replace the Goose and its forerunners, and it has reached the mock-up stage. The Mallard is to be an 8-10 seater and will be powered by two P. and W. Wasps. The amphibian gear will be of tricycle type and the cruising speed, at 55 per cent. power, is expected to be 182 m.p.h. The gross weight will be approximately 11,500 lb., and maximum range, with a crew of two, four passengers and 180 lb. of baggage, will be very little short of 2,000 miles.

RAPID CIVIL CONVERSION

LESS than ten hours after passing through the R.A.F. release machine at Uxbridge recently, Sqn. Ldr. Granville Rees, A.F.C., was on his way to Prestwick, en route to the Douglas works at Santa Monica, to collect the first of some DC-3s which British Aviation Services are ferrying from America to Brussels for Sabena.

Rees, who has joined B.A.S.'s permanent staff as chief delivery pilot, has spent ten years in the R.A.F. and had an excellent record in recent years as a v.i.p. pilot. He commanded the famous Liberator, AL.504, when it took Lord Reith and his telecommunications party on what was the first round-the-world flight accomplished by a British military aircraft, and last year he made a second world flight in a C.54.

ALDERNEY AGAIN

THE inter-island services between Guernsey, Jersey and Alderney were reopened, after a five-and-a-half-year lapse, on February 1st. Two weekly services to Alderney from the other islands are operated, on Tuesdays and Fridays. The last air service from Alderney, apart from some special flights, was in June, 1940, when the entire population of the Island evacuated to the U.K.

ALMOST A DOZEN

THERE are now some eleven airfields available for use by the casual civil aircraft operator—excluding those which are limited to use by aircraft on scheduled services only, and those for which prior permission for landing must be obtained. These are: Burnaston (Derby), Croydon, Guernsey, Jersey, Lympne, Perth, Ronaldsway (I.o.M.), St. Mary's (Scillies), St. Just (Land's End), Sywell (Northampton) and Teversham (Cambridge).

Though, for the present, with so few civil aircraft about, the amateur appears to be free to land more or less where he pleases and to talk his way out afterwards. Which is as it should be; rules in this country are intended to be obeyed with discretion. Among the eleven legally free airfields, one or two, notably Lympne, can hardly be considered to be available for "use," though the landing area is open.

ANOTHER SUNDERLAND FOR DODERO

THE third of the five Sunderlands purchased by the Compagnia Argentina de Navegacion Dodero, S.A., was christened *Brasil* at Hythe last Monday by Her Excellency Senhora Isabel de Aragao, the wife of the Brazilian Ambassador. This boat is intended for operations over the South Atlantic between Argentine and Europe, and seats only 21 passengers as compared with the 45 seats of its two predecessors. A high degree of comfort has been achieved by Short and Harland in their furnishings, which include a well-equipped kitchen, dining lounge, and cocktail bar on the upper deck, and fully-reclining seats for the 21 passengers in cabins on the lower deck.

The engines are Pratt and Whitneys of 1,200 h.p., and the payload of the aircraft, for a distance of 2,600 miles at a cruising speed of 165 m.p.h., is 8,000 lb. The *Brasil* was due to leave for Buenos Aires last week, via Lisbon, Bathurst, Natal and Rio de Janeiro.

But he missed the plane . . .

His journey was 1,800 miles "from door to door"—the last 1,600 covered by a great air-liner between midday and 6 p.m. But the 200 miles to the airport were hard going—a full day's journey by a ramshackle old car over rough roads. He missed the midday plane by a few minutes—and had to wait a week! Too bad! What he needed, of course, was some sort of reliable feeder service *to* the airport . . . . Percival Planes are made for that job.

LUTON AIRPORT, BEDS., ENGLAND

PERCIVAL AIRCRAFT

★A COMPANY OF THE HUNTING GROUP

C.R.C.4

View point

Soon the appearance of British Power Boat M.T.B.'s, M.G.B.'s and Rescue Launches will be a less ubiquitous sight in western waters. But craft of new design will take their place . . . the picket boats . . . seaplane tenders and custom launches of a world engaged in the vital tasks of re-establishing the threads of commerce throughout the seven seas.

THE BRITISH POWER BOAT COMPANY LTD.

CONSTRUCTORS OF SCOTT-PAINE SURFACE CRAFT

The European Set-up

Northolt as Terminal : Practical Direction : Priority Necessities

ALTHOUGH the situation at the moment is necessarily almost as chaotic as it could be, the immediate plans for the operations of B.O.A.C.'s European Division —eventually to be taken over by British European Airways—show promise of the right things to come. The primary difficulty at present is that of accommodation, both for aircraft and personnel, and it hardly seems possible that rapid progress can be made unless really high priorities can be given to civil aviation in the matter of building facilities.

During last week-end the European Division of B.O.A.C. officially accepted responsibility for services to Paris, Brussels and Amsterdam, but the change-over was necessarily more academic than real, and for some time to come these services will be run by R.A.F. crews and aircraft, while the maintenance work and traffic operations will be the responsibility of B.O.A.C. personnel who have been "shipped" for this purpose to the paraphenalia of Works and Bricks which is the present Northolt during the enlargement and reconstructive stage.

The European services are now being run from this terminal, where temporary buildings have been erected for traffic purposes, and where equally tentative arrangements have been made for the accommodation of maintenance crews. Towards the end of this month the present services to Madrid, Lisbon and Stockholm, which are at the moment being run from Croydon, will be re-based at Northolt. Empire and Atlantic services will continue to be operated from Hurn and Hythe until Heathrow and any new flying-boat base may be ready. Internal services, which are still being operated by the Associated Airways Joint Committee, will probably be running from Croydon for some time to come.

So far as the aircraft are concerned, austerity Dakotas will be used for the European services until the Vickers Vikings come into use in the summer. The priority system for passengers must necessarily remain, but this will gradually become less and less troublesome from the traffic point of view.

Among the immediate plans on the organisation side, two strike us as being excellent. One is that the operational centre will be actually on the airfield at Northolt, so that those who are directing the European Division will be closely and constantly in touch with reality, and the other is the appearance of practical flying people on the executive side. Apart from Mr. Gerard d'Erlanger and Mr. P. L. B. Wills (who is to be technical manager)—both of whom have plenty of "straight" flying experience—the present intention is to co-opt a real, live transport pilot, with up-to-date experience, to assist the management. Other members of the main directive team are Mr. J. W. S. Brancker, traffic manager and deputy to Mr. d'Erlanger, and Group Capt. J. E. V. Tyzack who will be service manager. Mr. Brancker has now had a long and varied experience on the traffic side and Group Capt. Tyzack has held important staff posts during the war. In addition it is proposed that a navigation and radar expert will also be brought into the management.

But before real progress can be made it is essential that work should go ahead rapidly on the building side. Apart from the needs at Northolt, the Corporation as a whole is suffering from an aircrew-training bottleneck and, though an airfield has been selected for this purpose, it is of vital importance that conditions at this airfield shall, as soon as possible, be made entirely suitable for the classroom and other work involved.

Finally, of course, the "civilianising" of the European services at present run by Transport Command will not be possible until negotiations have been completed between the Governments concerned and B.O.A.C. Civil Aircraft cannot just set off on scheduled services unless bilateral agreements have been reached. Here again, when considering the traffic potentialities at Northolt, it must be remembered that the European Division will need to handle not only their own traffic and aircraft, but also those of any other national operating companies which may be running parallel services. Furthermore, in addition to all these, internal services will no doubt be using Northolt when off-loading those passengers who are on their way to the Continent.

The European Division of B.O.A.C. obviously have before them an immense task, and the hopes for the future rest very largely on the amount of genuine co-operation which can be obtained from the different departments in the Government—particularly in the matter of building priorities.

FIDO AND HEATHROW

THE Fido installation at Heathrow will not be completed after all. This information was given last week by the Parliamentary Secretary to the Ministry of Civil Aviation. He added that experiments in fog dispersal for aviation purposes were, however, being continued.

This decision not to use Fido is hardly a surprise, for it had already been given once and, although the matter was under reconsideration, there are clearly a number of arguments against its use. First, Fido has only limited scope, for, while it will deal with certain conditions of fog, it will do nothing to disperse other forms of poor visibility; secondly, radar aids to navigation are improving day by day and are not restricted in their scope by any particular form of weather; thirdly, the expense of installing and maintaining Fido is considerable; and finally, as we said in *Flight*, of January 24th, although Fido can be regarded as a last emergency precaution for the safe landing of aircraft in fog, it is obviously very much better to divert such aircraft to some other airfield which is not similarly weatherbound.

Incidentally, the airfield extensions to Heathrow airport will now probably be to the north of the airfield. This will involve the diversion of the existing Bath road, which is parallel with the main E.-W. runway, and the taking over of a considerable area of land on the north side of the Bath road. The precise extent to which existing villages will be affected has not yet been disclosed officially, but there seems little doubt that the eventual demolition of a considerable number of houses will be involved.

However, to judge by present progress on the airfield, it will be a long time yet before work can begin on any major extensions, such as those which must be covered in the ultimate plan for an air terminal which is to carry the amount of traffic envisaged for Heathrow. In any case, no major airport can spring into being without being accompanied by an extensive project for the housing of essential airfield staff who must often be available twenty-four hours a day. It would seem likely that persons displaced from their homes by the enlargement of Heathrow will find that their houses are to be reprovided under some housing scheme embracing a solution of their problems as well as those of the airport staff.

R.Ae.C. CERTIFICATES

DURING 1945 the Royal Aero Club issued 444 Certificates. Incidentally, the cost of these is now 15s., with the addition of a further 5s. if the oral examination is held at the Club. After the issue of a Certificate, the Club applies to the Ministry of Civil Aviation for an "A" licence at a cost of 5s.

In order to assist the A.T.C., the Royal Aero Club has, during the war, been issuing Gliding Certificates at a figure well below cost price. These wartime fees have now been cancelled, and all such Certificates will now cost 5s. for each category, with a reduction of 50 per cent. in the case of A.T.C. cadets. The British Gliding Association has been forced to increase the price of their gliding badges. Except for the "A" type these, however, are not at present available.

Civil Aviation Licensing Changes

Four Classes for Power Pilots

IT has been realised for some time that important modifications are likely to take place in the licensing arrangements for civil aviation, following negotiations at the Chicago Conference in 1944 and other discussions which took place in London and Paris last year.

Apparently, four classes of pilot's licence are expected to replace the existing "A" and "B" licence system. The obvious intention is to differentiate as clearly as possible between the qualifying standards expected from private owners, commercial pilots and from regular airline pilots, and it will be generally agreed that this is a very sound and logical basis on which to work. The following are the four types of licence envisaged:—

(1) Provisional licence — for pupil pilots under training.
(2) Class "A" licence—for private pilots.
(3) Class "B" licence—for commercial pilots.
(4) Class "C" licence—for airline transport pilots.

No pilot will be allowed to undertake *regular* air line transport flying without first obtaining the "C" licence, but the new Class "B" licence will cover all commercial and normal flying other than regular airline work. The qualifications for the new Class "A" licence are expected to be rather higher than those for the existing "A" licence.

Naturally, the introduction of this scheme will necessitate changes in the air navigation regulations, and until these changes can be established, issue of the existing "A" and "B" pilot's licences will continue.

The provision of two forms of Glider Pilot's licence is also contemplated; a Glider Pilot's licence Class "A" for private gliding and a Class "B" licence for commercial work.

So far as navigators are concerned, the existing First and Second Class Aircraft Navigators' Licences will also continue until new regulations are established, but ultimately, provision will be made for only one such licence. Broadly, the new Aircraft Navigator's Licence will embody all the qualifications appropriate to the present first-class licence. However, in order that pupil navigators can gain practical navigational experience and be trained under competent supervision during flight, a "Cadet Class" Aircraft Navigator's Licence will become available for them. When the new regulations come into force the existing Second Class licence will disappear altogether, and the qualifications appropriate to it will become part of the requisite qualifications for the Airline Transport Pilot's Licence.

With the advent of heavy multi-engined aircraft, flight engineers have become indispensable members of crews, and, as might be expected, new licences are being introduced for them. As in the case of the navigators' licences there will be two of them, namely, a "Cadet Class," which will authorise the holder to be given training during flights, and the Aircraft Operational Engineer's licence for the fully qualified flight engineer.

The other important member of aircraft crews, the wireless operator, is at present issued with a proficiency certificate by the Postmaster-General, under the Wireless Telegraphy Acts of 1904 to 1926. It is expected, however, that a system of licences for aircraft radio operators will be instituted, and that some five different types of licence will be included. In the Aircraft Radio-Telegraphy category, licences are expected for Operators First Class, Operators Second Class, and Temporary Operators, whilst Aircraft Radio-Telephony licences will cover Operators and Temporary Operators.

Requirements for ground staff are not likely to be overlooked in the new regulations, and so changes can be expected in the licence regulations for ground engineers. At present, the ground engineer's licence enables the holder to certify that the construction, repair, overhaul, and maintenance of an aircraft meets the standards of airworthiness laid down. The new form of licence will have greater scope and will permit the holder to deal with varied classes of aircraft engines, and aircraft, instead of particular types. Naturally, the qualifications demanded for such licences will be more extensive in view of the greater range of responsibility granted. Present holders of ground engineer's licences will be required to qualify for the new licence when their own falls due for renewal.

With the increase in both the complication and the quantity of radio apparatus carried on aircraft, a much greater responsibility for maintenance of airborne radio equipment has devolved upon ground staffs. The certification of the airworthiness of this equipment is clearly a task for the radio engineer, and so an Aircraft Radio Engineer's licence is envisaged, which will have corresponding scope, in its own sphere, to that of the aircraft maintenance engineer's licence in the sphere of aircraft engines and aircraft.

CIVIL LICENCES ENVISAGED

Pilot
Provisional—Pupil pilot
Class A—Private pilot
Class B—Commercial pilot
Class C—Airline transport pilot

Glider Pilot
Glider Pilot Class A—Private
Glider Pilot Class B—Commercial

Navigator
Aircraft Navigator
Aircraft Navigator, Cadet Class

Radio Operator
Aircraft Radio Telegraphy Operator, First Class
Aircraft Radio Telegraphy Operator, Second Class
Aircraft Radio Telegraphy Operator, Temporary
Aircraft Radio Telephony Operator
Aircraft Radio Telephony Operator, Temporary

Flight Engineer
Aircraft Operational Engineer
Aircraft Operational Engineer, Cadet Class

Ground Engineer
Aircraft Maintenance Engineer
Aircraft Radio Engineer

EXHIBITION OF GERMAN AERONAUTICAL DEVELOPMENTS

When the instructive exhibition of German aircraft was held last autumn at the Royal Aircraft Establishment, Farnborough (see *Flight*, Nov. 8 and 15), the Minister of Aircraft Production, Mr. John Wilmot, was convinced that the display should also be made available to the general public as soon as possible at a central site. As a result, an exhibition of German Aeronautical Developments will be held under the auspices of the Ministry of Education at the Science Museum, South Kensington, commencing Thursday, 14th February.

This educational and highly interesting exhibition is admission free and will be open on weekdays from 10 a.m. to 6 p.m., and on Sundays from 2.30 p.m. to 6 p.m. It will be open for three months.

Mr. Wilmot felt that it was of the utmost importance that students and technicians as well as the general public should have an opportunity of having a close-up inspection of what the German aircraft industry achieved. Although, operationally, enemy aeronautical development was at all important times one step behind our own, the Minister felt that it would be of considerable educational value to display German aircraft and equipment to give a true overall picture of aeronautical development. The Science Museum is, therefore, an apt site in the circumstances.

The exhibits, provided by the Royal Aircraft Establishment of the Ministry of Aircraft Production, are selected from the most instructive examples shown at Farnborough. They include a number of typical German military aircraft, including a jet-propelled fighter, flying bomb, the gyro-kite for use with U-boats, a piloted V1, a V2 rocket and radio-controlled rocket weapons. Many components and photographs will be exhibited showing to the general public, for the first time, full details of enemy aeronautical development.

The exhibition coincides with the post-war reopening of the Science Museum for, in addition, the Museum also has a series of exhibitions relating to atomic energy, X-rays and the quartz crystal clock.

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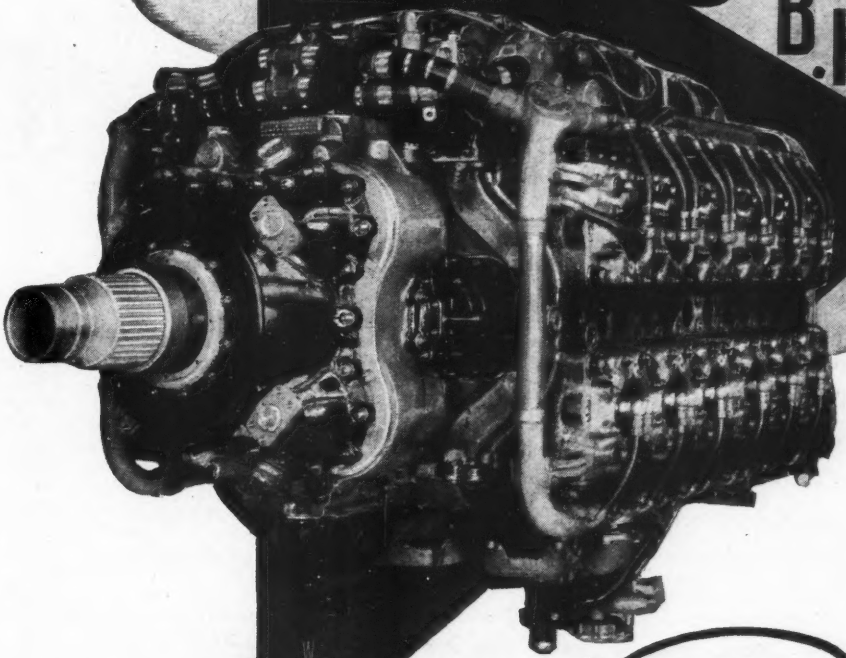

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American Newsletter

Reducing Airline Costs : "Service After Sales" : Passenger Handling

By "KIBITZER"

CONSIDERABLE thought is being given by U.S. aircraft and engine manufacturers to reductions in maintenance costs and to the amount of service that can be given to airline and other customers.

At one time, for instance, the Allison Engine Company was seriously considering a scheme whereby they would "rent" engines to the airlines, and, for an inclusive fee, would maintain these throughout their life, exchanging them as and when necessary. It was said that this scheme would even include the cost of the fuel and oil used. The Martin Company is now studying an overhaul plan for its "202," which would include the loaning of aircraft to airline customers while the original machines were being overhauled.

If schemes of this kind become widely adopted in the States, and perhaps even outside, they are bound to have a considerable effect on the final choice of prospective buyers, and it would probably be as well for the British aircraft trade to consider any steps which they, too, can take to compete with this form of "service." There is no doubt that the whole form of the thinking of the American firms, particularly towards their customers (and their agents), in the matter of spares and service is far and away ahead of anything so far suggested by any British manufacturer. An American agent's commission on private or small commercial aircraft is in the neighbourhood of 25 per cent., but for this he is expected to do far more, in the way of "customer service," spare stocking, local advertising and sales promotion generally, than his British counterpart. It will be interesting to see whether, as the aircraft distributor and dealer come more and more into the domestic picture, and as the competition both in quality and price becomes keener, the manufacturer will continue to rely on his agents throughout the country, or whether he will begin to think in terms of doing his own distribution, either direct or through an affiliated company of his own. It will pay the British aircraft manufacturer to watch these developments.

* * *

This service is not the only part of our public relations work which will need scrutiny. Self-examination will be necessary in the airline field, too, if we are to hold our own. There is a tendency for us to finish up our everything-is-lovely speeches by saying: "And, what's more, we can give the best airline service as well. Look how the British steamship lines always got the business because of the service they gave." True, they did. But it is sometimes forgotten that, as the speed of the journey increases, so the need for and chances of rendering a de luxe service *on board* decreases. Therefore, the type of old-fashioned service that was offered on a British aircraft—with the attentive steward who knew all "his" passengers' likes and dislikes and who put the studs in the dress shirt without so much as a thumb mark—is, unfortunately, outmoded, and we must apply our skill in other directions.

This means that, if the quality of the service rendered is to be a factor in attracting trade, we should concentrate on those parts of the journey which are *not* made by air. We should also take a look at our competitors and see how they have got on. An examination of the way the American lines handle their public shows that their service isn't all it's cracked up to be, and there is no doubt that, during the war, and quite understandably, it fell off very badly. On some lines it is now downright poor and an unscheduled stop, particularly if it is overnight, produces a condition near to chaos.

An exasperating habit of most American companies is that of never telling you definitely, until the last minute, whether they will start or whether they hope to get through on schedule. Nothing is guaranteed to make a passenger more angry than to learn at the airport that the flight is cancelled. By that time he has probably missed a train and cannot make other arrangements. This situation became so bad over here at one time that those of us who had access to the Army Air Forces' Weather Bureaus used to get our own weather reports ahead of time and then decide for ourselves.

But it must not be thought that this sort of thing will continue. It won't. The public relations officers of all the airlines here have been going very thoroughly into this question of passengers' comfort—chiefly by means of mailed questionnaires, and they have, by now, obtained a great deal of most valuable information. They have also considered all sorts of ways of popularising air travel. The stewardess was one. But even she has been outmoded by the simple expedient of reducing air travel cost. This latter has made it almost impossible to travel without a long-standing booking.

Of all the stunts that have been pulled to popularise air travel, however, there is one that is hardly likely to be repeated. The story goes that an airline, noticing that nearly all their clients were business men, and realising that the business man's wife was probably against flying, decided that, for a given period, wives would be included on any single ticket that was bought, and "bring your wife, too" was quite a slogan. Needless to say, the idea was a great success and happy couples flew everywhere. In fact, the company felt they were on a good thing—and so did the business men—until one day the statistical department sent all the business men's wives a questionnaire to find out their reactions. There were reactions all right when the tired business man got home that night. . . . "And when, may I ask, did I accompany you on an airline trip last month?" or "Do you mind explaining who your travelling companion was when you visited . . . ?" It took a long time for that one to settle down.

Yet, despite the considerable experience that the U.S. airlines have amassed, and their emphasis on public relations, there is, to a European, still something lacking in the way in which their passengers are handled. This may be because the "American way of life," as they call it, does not really lend itself to the giving of service to others, or it may be due to a basic feeling that each is as good as his neighbour, which, in its turn, develops a form of selfishness. Whatever it is—and claims to the contrary notwithstanding—good service is not the most outstanding feature of American airline operation.

* * *

It is my opinion that, at all times, the passenger should be considered as having a high, rather than a low, intellectual rating. In other words, once told what he or she should do, that should be the end of it. Passengers should not be nursed, or shepherded, or cajoled, to walk here or there. If one of them is fool enough to go off on a reciprocal course, that's his business, but provided he is once given a definite heading, surely he can work out his own salvation? If you get into the wrong train at Victoria, it is, after all, your own fault.

It must be remembered, however, that efficiency in the handling of passengers is not necessarily the same thing as giving them attention and courtesy. Efficiency alone has an inhuman quality, and there is no reason why the British airlines cannot be efficient and still keep their passengers content and happy.

But let nobody imagine that we shall not have to work very hard if we are to keep such a lead as we already

AMERICAN NEWSLETTER

have in this respect. Every airline operator in the States knows what is wanted, and all are determined that they will be there "firstest with bestest." The comparison between sea power and air power is continually being stressed, and although Britain's past superiority on the seas is admitted, the aviation trade and the administration are going to do their damnedest to seize the mastery of the air and, having seized it, to hold it. What is more, due to the head start that she now has, combined with great geographical and physical advantages, and a manufacturing "know-how" gained during these years of war, America is almost certain to attain that position inside the next three years.

If that be so, one only hopes that the resultant extension of world power will be accompanied by an acceptance of the far more important, but equally inevitable, international responsibilities that must go with such a position. Failure in this acceptance, and any attempt on the part of the American people to retire from world politics, could easily cost American aviation this lead.

High-speed Flight

The Second of Dr. Hooker's Cantor Lectures

BEFORE the Royal Society of Arts on Monday, January 28th, Dr. S. G. Hooker, B.Sc., D.I.C., chief engineer of the Rolls-Royce gas turbine Section, delivered the second of three lectures. The collective title of his lectures in the Cantor series is "High-speed Flight"; in the first, Dr. Hooker briefly traced the development of the aircraft engine from its inception up to modern times. Particular attention was given to the Merlin engine, and the sharp contrast between figures for the maximum speed records in the inter-war years and the speed attained by our contemporary fighters was the subject of special comment.

Dr Hooker said that "until the statesmen of the world have definitely enforced a system in which wars cannot happen, we must still continue with the development of defensive military aircraft at the highest possible pressure. There is no logic, sense or saving in trying to run the half-way course of, on the one hand, a policy of power politics and, on the other, an armoury inadequate even for defensive purposes. Numbers may not be necessary, but superiority in performance is absolutely essential."

He added also: "It should be stressed how dangerous and expensive it is to delay such developments until the last moment, and the question should be asked as to what would have been the effect on this war if our military fighters had had a performance reasonably close to that of the record machines? In other words, how much better it would have been if the aircraft and engine development of the last few years had been spread more uniformly over the preceding fifteen. It is not a sound argument to say that despite these criticisms our aircraft were better than anybody else's. That they could have been much better is not open to question.

"It is significant to note that in 1929-30 the Rolls-Royce "R" engine used in the Schneider Cup Races actually produced one h.p. for every 0.7 lb. of weight, and if nothing else came out of the Schneider Trophy Races, this achievement in itself would have been sufficient. The fact that an engine of 1,600 lb. weight did actually produce in 1931 between 2,300 and 2,600 h.p. established even in those days the practicability of present-day aero engines."

Dr. Hooker opened his second lecture by stating that "as far as the piston engine is concerned, it is evident that the weight per b.h.p. developed is stabilising round about one lb./b.h.p., and there are likely to be grave mechanical difficulties in producing piston engines of greater than 3,000/4,000 b.h.p." He said it was interesting to note that at the present time the world's speed record was gained for Britain by virtually a standard Gloster Meteor fighter and that it could be stated that the R.A.F. will shortly be equipped with Meteor fighters capable of 600 m.p.h. and with tremendous rates of climb. Speed increment will only be accomplished by disproportionately large increases in thrust, but this thrust will also be available to improve the rate of climb.

It was pointed out that a single-seat machine of approximately 9,000 lb. all-up weight would require an engine of about 5,000 to 6,000 h.p. to have a sea-level speed of 500 m.p.h. As airscrew efficiency decreases with increased speed, still greater powers will be necessary at higher speeds. The net result will be that if an aircraft is driven by an airscrew, the engine must produce about 7,500 h.p. to achieve a speed of about 500 m.p.h. Such an engine would be of tremendous weight and bulk as compared with the gas turbine.

Dr. Hooker said that it is commonly believed that jet propulsion engines are only efficient at high altitudes and high speeds. This is not really true, as the gas turbine engine is efficient at high speeds irrespective of altitude. At high altitudes, however, due to the lower density of the air, the power required to drive an aircraft at 500 m.p.h. is much reduced, and consequently the fuel consumption of the engine is also much reduced. At speeds in excess of approximately 500 m.p.h. the simple jet engine is far better than the piston engine for aircraft, and it is just as economical. Its fuel consumption is large because it produces enormous powers.

R.A.F. PERMANENT COMMISSIONS

AN Air Ministry Order dated January 3rd, 1946, gives rules for applications for permanent commissions in the R.A.F. Officers who have not already applied are now given the opportunity to do so, and those who have already applied (excepting returned prisoners of war) but have not yet been told of the result, are invited to apply again. The applications of former prisoners of war are still being considered. Those from the general service, technical, equipment, accountant, medical, dental, or chaplain branches are eligible to apply if they were: (1) serving on short service commissions on September 1st, 1945; (2) in the R.A.F.O.; (3) A.A.F. and its reserve; (4) R.A.F.V.R.; (5) ex-regular airmen granted emergency commissions; (6) officers holding extended service commissions; and (7) non-regular Army officers employed with the R.A.F.

Officers of the administrative and special duties branch, the balloon branch, and the R.A.F. Regiment may now submit applications. Officers of the Dominions Air Forces may apply through their overseas H.Q.s in London, but Officers of the Royal Canadian Air Force must understand that they cannot afterwards be transferred to the R.C.A.F.

Normally the applicants for the general duties branch must be under 30 on January 1st, 1946, and those for other branches under 35.

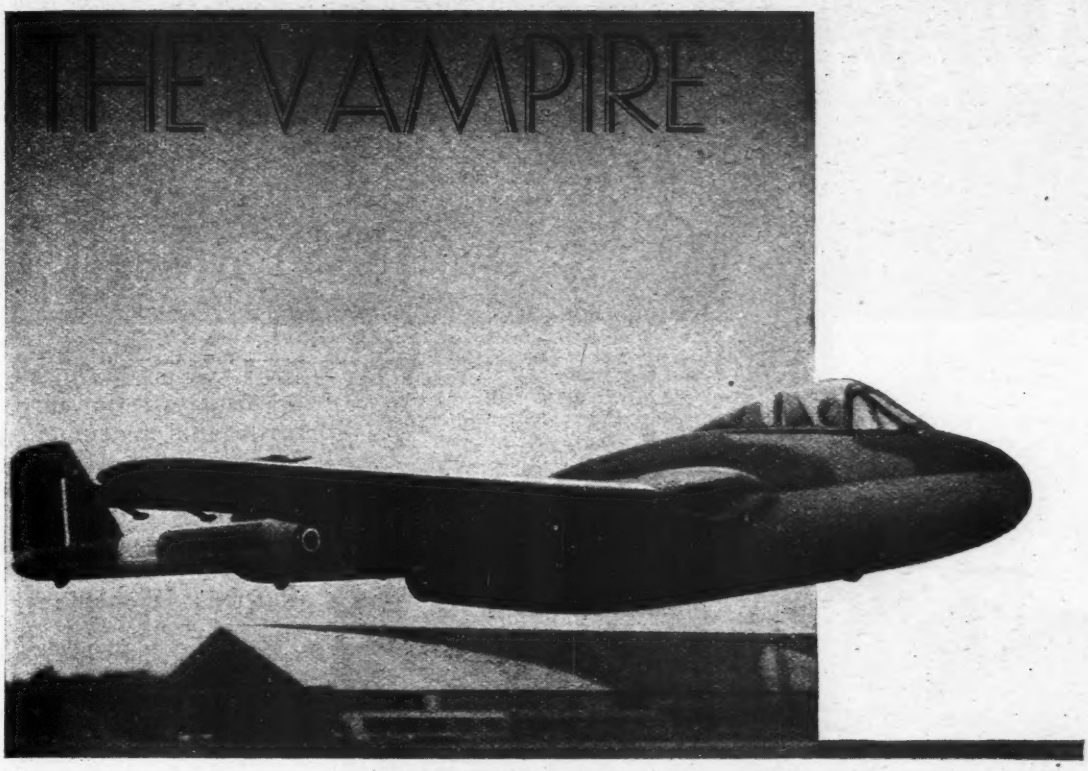
Officers with less than six months' commissioned service will be given the substantive rank of Pilot Officer; those with over six months but less than 3½ years' commissioned service, Flying Officer; those with more than 3½ years, Flight Lieutenant. After that, age and temporary or acting rank are taken into account. The rules are different for the medical and dental branches, and those for the chaplains' branch will be issued later.

In deciding the place in the substantive gradation list by officers commissioned under this scheme, such consideration as disembodied service in the A.A.F. or R.A.F.V.R. will be taken into account.

JOINT AIR-SEA ANTI-SUBMARINE SCHOOL

ARRANGEMENTS have now been completed for the establishment of a joint Admiralty and Air Ministry Anti-submarine School. The permanent location has not yet been agreed upon, but the school will be temporarily housed in Ebrington Barracks, Londonderry, Northern Ireland.

Aircraft of the Naval Air Arm and the Royal Air Force will operate from the R.A.F. stations at Ballykelly and Castle Archdale, and a number of submarines of the Royal Navy and a flotilla of anti-submarine escort vessels will be based at Londonderry, which will thus continue as a naval base instead of being closed down now that the war is over.



. . . up she rises

"Geoffrey de Havilland wasted no time in retracting the undercarriage of the Vampire which he demonstrated so ably at Heston." *The Aeroplane*, Oct. 12th.

Speed, even in raising the undercarriage, is essential on an aircraft as quick off the mark as this de Havilland Vampire, and so Lockheed Hydraulics were chosen : they retract the undercarriage in 2½ seconds.

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Coastal Command's Own War

Part II—The Anti-shipping Campaign

By MAJOR F. A. de V. ROBERTSON, V.D.

THE last article about the activities of Coastal Command dealt with its Anti-U-boat activities. Those operations were from the strategic point of view defensive; they helped to preserve our all-important shipping convoys from under-water attacks which, if pressed home without let or hindrance, might have brought the United Kingdom to its knees from sheer starvation accompanied by lack of fighting materials. But from almost the beginning of the war Coastal Command also engaged in offensive operations against German shipping.

The targets included both German warships and merchant vessels. It is a fact that the Germany Navy never contemplated a fleet action on the lines of Jutland. Admiral Tirpitz had made a strategical error when he built a fleet of battleships designed to challenge Britannia's rule over the surface of the seas. His successors in the inter-war years succeeded in dodging the provisions of the Treaty of Versailles by building what were popularly called pocket battleships. These vessels were of 10,000 tons, and only three were built, namely, the *Deutschland* (afterwards renamed *Lutzow*), the *Admiral Scheer*, and the *Admiral Graf Spee*. In 1936 the Germans launched the *Scharnhorst* and the *Gneisenau* of 26,000 tons each, with a main armament of nine 11in. guns and a speed of 27 knots. Finally, having decided to disregard the Versailles Treaty altogether, the Germans in 1939 launched the huge battleship *Bismarck* of 35,000 tons, with a main armament of eight 15in. guns and a speed reckoned at about 28 knots. A sister ship, the *Tirpitz*, was completed later. Germany also possessed a number of cruisers of various categories.

The German battle fleet was not intended to challenge the British Navy in a fleet action, but rather to prey upon the convoys from America and, later on, to attack those taking munitions to Russia. It was obviously the duty of Coastal Command to watch these powerful raiders and to hit them when possible.

At first the Command was handicapped by lack of suitable equipment. At the outbreak of war it had only two squadrons of torpedo-bombers, Nos. 42 and 44, and they were equipped with Vildebeests, which were good load-carriers, but had not a very long range. These two squadrons could not play much part in the war until, in 1940, they were re-equipped with Beauforts. The torpedo proved the most formidable weapon for use against ships.

Invasion of Scandinavia

When Hitler invaded Norway, Coastal Command gave all the help it could to the defence. In June, 1940, some Hudsons and a few long-range Blenheims attacked a German cruiser of the *Hipper* class in the fiord of Trondheim and scored hits with bombs. Later in the year hits by three bombs sent the *Scharnhorst* into dock until the end of the year. This powerful ship was destined to do no little damage to British shipping, and it is believed that it was she that sank the armed merchant cruiser H.M.S. *Rawalpindi*. So it was very helpful to the Allied cause to have her out of action for several months.

In the autmn of 1940 the Battle of Britain broke out, and then Coastal Command joined with Bomber Command in attacking the invasion ports on the Continent. Much damage was done to enemy barges, but the Command had few aircraft available, and the temerity with which the pilots delivered mast-high attacks resulted in considerable losses.

In May, 1941, a Coastal Command aircraft spotted the *Bismarck* moving out from a Norwegian fiord to steam round the north of the British Isles and so get loose into the Atlantic. The Admiralty was informed, and the Royal Navy, with its gallant air arm, was laid on her trail. How faithfully they dealt with the mighty raider is now a matter of history; but the triumph might never have been brought off but for the vigilance of Coastal Command.

In June, 1941, the Beauforts began to come prominently into the picture, and their torpedoes started to prove their worth. Three of them torpedoed the *Lutzow* off the coast of Norway, and though the ship was not sunk, she was put out of action for some time. Her sister, the *Admiral Graf Spee*, had been so battered by British cruisers off the River Plate that Hitler ordered her commander to scuttle her in the river. He obeyed, and then shot himself. That left only one of the three "pocket battleships," the *Admiral Scheer*, fit for action; and she remained strangely quiescent till near the end of the war, when she was capsized at her moorings by the heavy bombs of Bomber Command.

German Warships in Port

For most of 1941 Brest was the centre of naval and air interest. The *Scharnhorst*, *Gneisenau*, and *Prinz Eugen* had taken refuge there on their return from raids in the Atlantic. Bomber Command made innumerable attacks by night; but the harbour was very heavily defended, and, though it seemed certain that the ships must have been damaged several times, none of the bombs inflicted vital injury. Then, in the autumn, a single Coastal Beaufort dodged through the defences, and launched a torpedo. It may have hit the *Scharnhorst*, but the gallant pilot did not return, and so there was no actual knowledge of what this daring attempt accomplished.

Attacking enemy warships was not the only activity of the anti-shipping side of Coastal Command. The enemy's coastal shipping was its regular target. The railways in Germany and in the occupied territories were by this time badly overworked, and Fighter Command was destroying large numbers of locomotives in northern France. The Germans sought relief by using water transport wherever possible. Inland canals played a great part in their war-time transport system, and so did coastwise shipping. The latter was clearly the pigeon of Coastal Command. Hampdens which could carry torpedoes were placed at the disposal of the Command, and four squadrons of them regularly raided the traffic all the way from Norway to the Bay of Biscay. The first step was unremitting watchfulness by reconnaissance machines, and when a convoy was spotted a striking force was despatched.

In the late summer of 1942 the battleship *Tirpitz* was spotted in a fiord in the extreme north of Norway, where she threatened our convoys to Russia. We could not send out the heavy battleships of the Home Fleet to escort every convoy; though later on it happened that when the *Scharnhorst* attempted to interfere with one convoy she was sunk by the naval escort, after a very adventurous career. But the lair of the *Tirpitz* was out of reach of our home bases. This difficulty was overcome by sending two squadrons of Hampdens to Russia where they could keep an eye on the would-be raider. The *Tirpitz* evidently did not appreciate the prospect of an attack by torpedoes dropped from the air. Her captain perhaps remembered how the Swordfish torpedo-bombers of H.M.S. *Ark Royal* had hit the rudders of the *Bismarck* and so made it possible for H.M.S. *King George V* and *Rodney* to batter her turrets to pieces. At any rate, the *Tirpitz* sat in Alten Fiord and did nothing. Finally she was sunk by Bomber Command. But, if Coastal reconnaissance had not discovered her the story might have been very different.

In the winters of 1942-43 and 1943-44 armed merchant

COASTAL COMMAND'S OWN WAR

cruisers with valuable cargoes from the Far East appeared in the Bay of Biscay and tried to run the blockade. This meant another job for Coastal Command, and its long-range reconnaissance machines spotted many of them and passed on the information to the Navy. As a result, many of these ships were attacked and a proportion of them sunk.

In 1943 the Command received Beaufighters, and a bit later on some of them were equipped with R.P. (rocket projectiles). Then the Command was able to put into practice the lessons learnt during the period of costly low-level attacks. The German convoys were mostly escorted by *flak* ships, and a powerful air escort was sent with the striking force to attack these ships and leave the way clear for the machines which carried the torpedoes and rockets. It was desirable to send a large air escort so as to confuse the gunners on the ships. So the Strike Wing came into being. It would send out one squadron with torpedoes or R.P. to attack the merchant ships, while other squadrons, in the anti-*flak* role, with cannon and R.P., would give covering fire. Where possible, fighters would provide top cover.

In the summer of 1943 some strike squadrons had to be sent to the Mediterranean. One Strike Wing was maintained on the East Coast of England to operate against the Dutch coast, and this forced the Germans to give up using the port of Rotterdam. At the same time two Strike Wings were kept in Scotland to operate against shipping along the Norwegian coast. As a result practically no enemy convoys moved by day along the Norwegian and Dutch coasts.

E-boat Patrols

One major task of the anti-shipping squadrons was the defence of our invasion convoys from E-boats and other small warships. From 1942 onwards continual night patrols were flown by Whitleys and Swordfish, and later by Wellingtons, Albacores, and Beaufighters. In summer the number of these patrols was increased. There was fighting practically every night, and sometimes there were as many as 70 attacks in a night. Wellingtons using radar and V.H.F. R/T. spotted for our motor torpedo boats. In three months Coastal aircraft sank 33 enemy small ships and damaged 135. Early in 1945 the German midget submarines made their appearance, and hundreds of them massed on the Dutch coast. They were elusive targets, but none the less Coastal aircraft made no fewer than 60 attacks on them, and at least 16 of them were definitely sunk. This must be rated as a defensive operation.

The offensive against the enemy merchant vessels, however, went on. At times the Strike Wings combined to carry out some special attack, and on June 15th, 1945, more than 50 aircraft made what was regarded as a copy-book attack on two ships with valuable cargoes which were protected by 18 escort vessels. The Beaufighters sank both the merchant ships without loss to themselves. Many attacks of a similar nature followed. In August of the same year the Beaufighter Wing based in Cornwall scored a brilliant success against the remnants of German shipping left in the Bay of Biscay. Two destroyers and two *Sperrbrechers* (minesweepers) were sunk with rockets.

In September our patrols flew repeatedly into the Heligoland Bight, and on one occasion a force of 70 aircraft managed to get past the heavy defences of Den Helder and attacked German fleet auxiliaries at anchor.

Before the end of 1944 the Beaufighter squadrons of the Command were re-equipped with Mosquitoes armed with rockets.

Back to Norway

Once France had been set free, the centre of interest changed from the Biscay ports to those of Norway, and the Norwegian waters became so dangerous for the enemy that their convoys, even though they could count on escorts of fighter aircraft, were obliged to lie up during the daytime. Even then they still could not hide from the machines of the Command engaged on night offensive reconnaissance.

As the German armies fell back, shipping communications between the Reich and Norway grew in importance. Reinforcements from Norway were ferried across the Skagerrak and Kattegat, and munitions, etc., needed in Norway were carried on the return trips. In October, 1944, two Halifax squadrons were told off to harry this transport, and they did a great deal of damage to it. Germany was by now "in its flurry" (as whalers say) and Coastal pressed home its attacks with increased fervour. By March, 1945, drop tanks for Mosquitoes became available, and these made possible long-range day strikes. Meanwhile Bomber Command had sewn the waters round Norway very thickly with mines; as a consequence, the U-boats felt compelled to remain on the surface. The captains preferred the risk of air attacks to the chances of hitting a submerged mine. So Coastal machines found many good targets, and attacked them with zest.

In the last week of the war the Germans tried to evacuate some troops from the northern German ports. The damage which Coastal Command inflicted on the transports was devastating.

Statistics of attacks and sinkings do not tell the whole story of the effort of Coastal Command's anti-shipping side. The whole plan of the vital German sea communications from Bordeaux to Trondheim was disrupted. Admiral Dönitz' order to surrender must have come as a blessed relief to all those Germans who went down to the sea in ships.

THE R.A.F. FILM UNIT

SHARING Pinewood Studios with the Army Film Unit, the Crown Film Unit, and later with the Polish Air Film Unit, the R.A.F. Film Unit was first established in August, 1941, with a handful of officers and other ranks in one room at the Air Ministry. It moved to Pinewood, near Uxbridge, early in 1942, and by the end of the war its establishment had risen to more than 400 personnel, nearly half of whom were cinema technicians.

The majority of the Unit's productions were intended for showing only within the Service; many, in fact, were in the "top secret" category. Nevertheless, the public saw over 20,000ft. of film showing the R.A.F. in action—film taken by the Unit's flying cameramen and later exhibited by the British newsreel companies between March, 1942, and June, 1945.

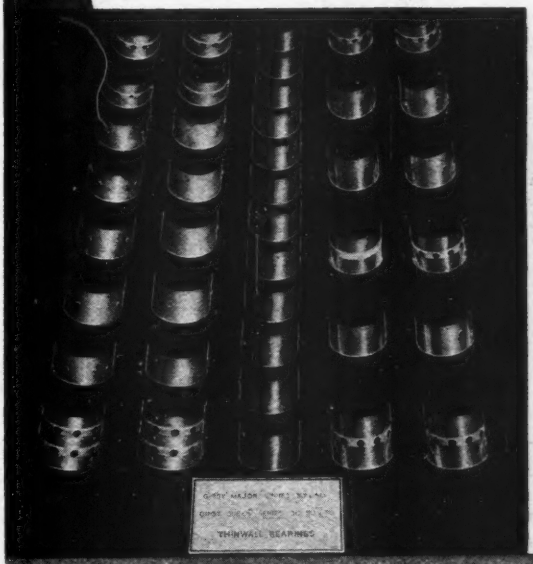
Altogether the R.A.F. Film Unit produced, at Pinewood, films totalling 128 production reels, equivalent in running time to 15 full-length feature films. These included a number of documentaries, notably *Target for To-night*, and more recently *Journey Together*. . .

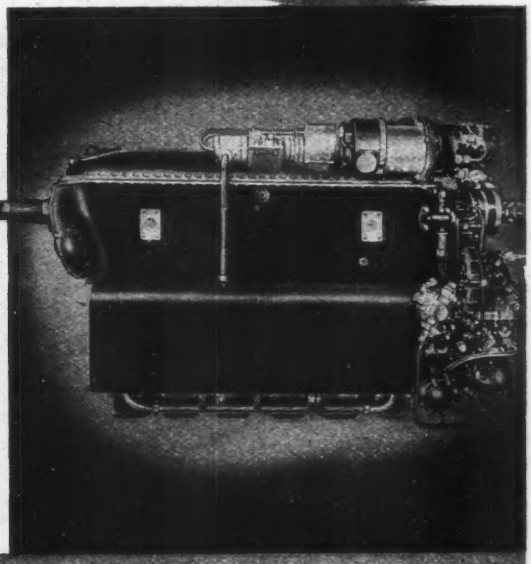
Among the "top secret" films which may now be mentioned was a complete sound and visual briefing for the aircrews who, a few days later, smashed the great oil centre at Ploesti. This was a "rush job" on which a section worked continuously for seven days with only three breaks for sleep, and which was then flown out to North Africa; it was made at the request of a senior American officer. But perhaps the film which aroused the greatest technical interest was the Unit's record of the sinking of the *Tirpitz*, which showed precisely where each of the 12,000 lb. bombs exploded. Another record which made R.A.F. film history was the one taken in a Mosquito that accompanied the first attack on a V.1 site.

The first film made by the Unit's Operational Section was "shot" from a Lancaster on one of the first 1,000 bomber attacks. Altogether this section flew 683 sorties against the Germans in North-West Europe, besides many other operational flights in the Mediterranean and Far East. During these operations, 13 members of the Unit lost their lives and seven were taken prisoner. Nine were awarded the D.F.C. and three received the *Croix de Guerre* in covering operations of the French Lorraine Squadron of the R.A.F.

NOW— DE HAVILLAND ON...

VANDERVELL THINWALL BEARINGS





★ VANDERVELL PRODUCTS LTD., WESTERN AVENUE, PARK ROYAL, LONDON, W.3 ★

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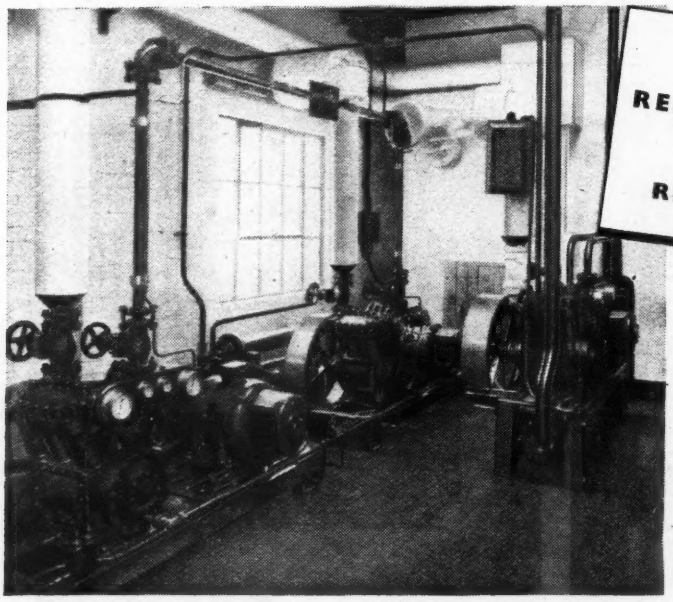

PRESTCOLD
REFRIGERATION EQUIPMENT
FOR
RESEARCH AND TESTING

The installation illustrated is used by Delaney Gallay Ltd. in connection with the design and testing of aircraft radiators under full load at temperature conditions encountered in high altitude flying. It includes a 45 h.p. refrigeration plant which cools 2,000 gallons of liquid to – 55°/ – 60°C.

An investigation of the application of refrigeration in your factory would gladly be made.

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CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

R.A.F. SLANG

"Strip-tearing" Began at Cardington

ANENT "strip tearing," balloons were rapidly deflated at Cardington in 1939-40 by pulling off a strip 6in. wide by 6ft. long, and it was the practice to threaten bombasts with the same procedure.

W. G. HICKS.

LONG-DISTANCE RECORD

Potentialities of the Wimpey

I READ with interest Mr. A. Sansom's letter in *Flight*, January 10th, 1946, concerning the long-distance record. He suggests that the Lancaster is a suitable aircraft for regaining the above-mentioned record, but, good as the Lancaster is, I think that the Wellington MkI is capable of a greater range.

Below are some comparative figures which I have worked out with regard to the range qualities of the two aircraft.

	LANCASTER I (Four 1,260 h.p. Merlin XX)	WELLINGTON I (Two 1,000 h.p. PEGASUS XVIII)
Wt. empty	34,000 lb.	18,000 lb.
Crew 5	1,000	1,000
Oil	1,500	750
Fuel (4,900 gall.)	36,500 (2,750 gal.)	19,950
Wt. loaded	73,000 lb.	39,700 lb.
Wing loading	56.1 lb./sq. ft.	47.2
Power loading	14.6 lb./h.p.	19.8
Range cruising	8,000 miles (at 190 m.p.h.)	10,000 miles (at 175 m.p.h.)
Duration	42 hr.	57 hr.
Consumption per engine	29 gall./hr.	24 gal./hr.

JOHN LAWSON COVERDALE.

BLIND APPROACH

Met. Pilots versus the Birds

HAVING had the privilege of being for two years a member of that small but happy band of Met. Flight pilots, I have heard in my time many lines about bad-weather flying, but the one that I remember best is that "shot" by a colleague as he climbed out after having landed in a really good "pea-souper." Pointing skywards, he said, "A couple of birds up there asked if they might formate on me on the way in. They reckoned that it was too thick for them to make it down to the deck on their own."

As a matter of serious interest, can any of your readers tell me if birds do fly above areas of thick and unbroken fog and make descents through it to earth? We frequently met those intrepid seagulls off the Norfolk coast at altitudes of 10 ft. or so in fairly thick fog, and frequently carried the necessary proof back to base in the radiator, but, to my knowledge, none of us ever saw a bird of any kind flying over the top of a thick, unbroken, and extensive fog layer.

May we members (past and present) of this happy breed of flying weather men thus claim to have beaten the bird, or can some reader claim equality for our feathered friends on the question of proficiency on blind approach?

EX-MET. FLIGHT PILOT.

HEATHROW

Loading and Momentum

I THINK that the average pilot of large aircraft will tend to agree with the statements, however loose, which have appeared about the difficulty of making cross-wind landings with large aircraft, and not so much with "Puzzled." Though your correspondent may be quite right in saying that a heavily loaded aircraft can be more easily landed across wind than one that is lightly loaded, so much depends on various other considerations. All is well, thanks to the additional momentum of a heavy aircraft, so long as ample control is available at final approach speeds, and so long as the pilot does not make a mistake—but it is surely not fair so to place all the responsibility on him and demand the execution of a cross-wind landing on nearly every arrival at any particular airfield. After all, the pilot might fail to complete the drift neutralisation and landing action at the right coincident moment, so that the aircraft would start to drift off the runway just before touching, and he would then need to make up his mind immediately whether to complete the landing or to go round again. With a hundred-tonner the drift and necessary ground correction after landing might be more than the tyres would stand, while "overshoot" procedure might, in bad weather, involve the crew in yet another quarter of an hour of S.B.A. routine. We are surely asking too much of the captains of really large aircraft in expecting them to cope regularly with cross-wind arrivals.

Incidentally, the *speed* of drift will be the same for any aircraft, whether landing at 50 or 100 m.p.h.—it is merely that the relative *angle* of drift is smaller with the faster landing.

J. B.

COMPACT POWER

The "Magic" Figure of 100 b.h.p./litre

IN the issue of *Flight*, dated January 17th, under the heading "Compact Power," the b.h.p. per litre of several engines is compared, and you ask who will be the first to achieve 100 b.h.p. per litre. As a point of fact this figure has been practically achieved on the Merlin engine.

From the engineer's point of view, however, the method of assessing an engine's performance by the power developed per litre capacity is not entirely sound since it tends to favour the engine with a very short stroke.

For mechanical and other reasons, all engines are found to develop their maximum power at approximately the same piston speed. Since piston speed is a function of the length of stroke multiplied by r.p.m., a long-stroke engine will have to be run at lower r.p.m. than a short-stroke engine to give the same piston speed.

The horsepower developed by an engine is given by the formula:—

$$\text{b.h.p.} = \frac{\text{PLAN}}{33{,}000}$$

where P = mean effective pressure
L = length of stroke
A = piston area
N = r.p.m. ÷ 2 (For 4-stroke cycle engines).

As already stated the product of L and N is approximately constant for all engine sizes which means that the horsepower formula could be rewritten as:—

$$\text{b.h.p.} = K\,(P \times A)$$

where K is some constant.

From this rewritten formula it is at once evident that the power of an engine is proportional to the mean effective pressure multiplied by the piston area.

Since the mean effective pressure is a function of the degree of supercharge employed, from practical considerations piston area becomes the controlling term in comparing the performance of engines of different types.

Expressing the figure of 60.5 b.h.p./litre for the Griffon 65 in terms of piston area we find that the figure becomes 6.55 b.h.p./sq. in. The published rating of Griffon 130 incidentally gives the higher figure of 7.15 b.h.p./sq. in. of piston area.

On the new basis of comparison the figure of 83.5 b.h.p./litre for the Sabre VII becomes 6.50 b.h.p./sq. in. of piston area.

In conclusion, your article on the Merlin 130 series in *Flight*, January 21st, states that powers in excess of 2,000 b.h.p. have been recorded on the test beds at Derby. This is equivalent to 96.3 b.h.p./litre. The development proceeding at the time resulted in a type test rating giving 8.0 b.h.p./sq. in. The highest sustained b.h.p. figure recorded on the test bed was 2,640 which gives the remarkable figure of 9.6 b.h.p./sq. in., and but for the cessation of hostilities this figure would no doubt eventually have been cleared for combat use. As a matter of interest, this figure is equivalent to 98 b.h.p./litre.

From the foregoing it will be seen that a target figure of 10 b.h.p./sq. in. of piston area might mean more to the engineer than the layman's magic figure of 100 b.h.p./litre.

This letter is not in any way meant to decry the very fine achievement of the 3,000 h.p. Sabre engine, but is an attempt to show that there is possibly a better method of comparing the performance of engines of widely different design.

G. MORRIS,
Rolls-Royce, Ltd.

PEACETIME OCCUPATION: With its Seafires crowded together on the flight deck, the famous aircraft carrier H.M.S. *Formidable* left Sydney recently carrying 800 service personnel. Both Britain and America have found carriers most useful for trooping.

SERVICE AVIATION

Royal Air Force and Naval Air Arm News and Announcements

Retirements

AIR MARSHAL SIR JOHN S. T. BRADLEY, K.C.B., C.B.E. Oct. 27th, 1945.

Air Marshal Sir Philip BABINGTON, K.C.B., M.C., A.F.C. Dec. 1st, 1945.

Awards

Naval Air Arm

THE KING has been graciously pleased to approve the following award:—

Distinguished Flying Cross

Lt. Cdr. P. E. CARR, R.A.N.

For courage and devotion to duty in flying operations in the Far Eastern theatre of war from April to October, 1943.

Royal Air Force

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations.

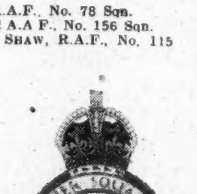
Bar to Distinguished Flying Cross

Sqn. Ldr. C. A. FRASER-PETHERBRIDGE, D.F.C., R.A.F.V.R., No. 35 Sqn.
Act. Sqn. Ldr. H. J. BREWER, D.F.C., R.A.F.V.R., No. 83 Sqn.
Act. Sqn. Ldr. J. F. BROOKES, D.F.C., A.F.C., R.A.F.V.R., No. 617 Sqn.
Flt. Lt. E. W. ADAMS, D.F.C., R.A.F.V.R.
Flt. Lt. S. A. ANNING, D.F.C., R.A.F.V.R., No. 617 Sqn.
Flt. Lt. C. GRANNUM, D.F.C., R.A.F.V.R., No. 12 Sqn.
Flt. Lt. T. J. HARVEY, D.F.C., R.A.F.V.R., No. 7 Sqn.
Flt. Lt. E. G. HADINGHAM, D.F.C., R.A.F.V.R., No. 100 Sqn.
Flt. Lt. H. L. INNISS, D.F.C., R.A.F.V.R., No. 83 Sqn.
Flt. Lt. A. MEAGHER, D.F.C., D.F.M., R.A.F.V.R., No. 227 Sqn.
Flt. Lt. J. A. WILLIE, D.F.C., R.A.F.V.R., No. 7 Sqn.
Act. Flt. Lt. T. KENNEDY, D.F.C., R.A.F.V.R., No. 156 Sqn.
F/O. E. E. AMERASEKERA, D.F.C., R.A.F.V.R., No. 640 Sqn.
F/O. M. GASKIN, D.F.C., R.A.F.V.R., No. 7 Sqn.
F/O. C. W. EATON, D.F.C., R.A.F.V.R., No. 97 Sqn.
F/O. R. R. ORMISTON, D.F.C., R.A.F.V.R., No. 97 Sqn.
Act. Flt. Lt. J. L. SAYERS, D.F.C., R.A.A.F., No. 617 Sqn.
Act. Flt. Lt. B. D. MCCLENAUGHAN, D.F.C., R.A.A.F., No. 7 Sqn.
Sqn. Ldr. G. B. ELLWOOD, D.S.O., D.F.C., R.C.A.F., No. 617 Sqn.
Act. Sqn. Ldr. G. J. BROWNELL, D.F.C., R.C.A.F., No. 582 Sqn.
Act. Sqn. Ldr. M. R. CUELENAERE, D.F.C., R.C.A.F., No. 630 Sqn.

Distinguished Flying Cross

F/O. R. D. MARSHALL, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
F/O B. S. MULCAHY, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
F/O. B. MULLINS, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
F/O. A. S. SAUNDERS, R.A.A.F., No. 166 Sqn.
F/O. A. G. STUTTER, R.A.A.F., No. 463 (R.A.A.F.) Sqn.
F/O. F. R. WRIGHT, R.A.A.F., No. 78 Sqn.
P/O. A. M. THOMPSON, R.A.A.F., No. 156 Sqn.
Act. Group Capt. R. H. SHAW, R.A.F., No. 115 Sqn.

Badge of No. 146 Wing H.Q., R.A.F.—"Proxime et Celerrime" (In close, in quick).



Badge of No. 223 Squadron, R.A.F.—"Alae defendunt Africam" (Wings over Africa).

Wing Cdr. G. K. BUCKINGHAM, R.A.F.O., No. 622 Sqn.
Sqn. Ldr. D. G. HUNTER, R.A.F.O., No. 692 Sqn.
Sqn. Ldr. A. PRICE, R.A.F.V.R.
Act. Sqn. Ldr. D. COLBY, R.A.F.V.R., No. 571 Sqn.
Act. Sqn. Ldr. A. F. HILL, R.A.F.V.R., No. 582 Sqn.
Act. Sqn. Ldr. G. M. HOWES, R.A.F.V.R., No. 207 Sqn.
Act. Sqn. Ldr. G. J. P. MORHEN, R.A.F.V.R., No. 150 Sqn.
Act. Sqn. Ldr. E. R. RICHES, R.A.F.V.R., No. 103 Sqn.
Flt. Lt. J. M. BARNES, R.A.F.V.R., No. 692 Sqn.
Flt. Lt. E. F. BELCHER, R.A.F.V.R., No. 619 Sqn.
Flt. Lt. A. L. BIRD, R.A.F.V.R., No. 195 Sqn.
Flt. Lt. R. E. BOYD, R.A.F.V.R., No. 195 Sqn.
Flt. Lt. W. BROWN, R.A.F.V.R., No. 61 Sqn.
Flt. Lt. J. F. CARNEGIE, R.A.F.V.R., No. 109 Sqn.
Flt. Lt. R. C. CHAPMAN, R.A.F.V.R., No. 195 Sqn.
Flt. Lt. E. COOK R.A.F.V.R., No. 427 (R.C.A.F.) Sqn.
Flt. Lt. L. T. GARDINER R.A.F.V.R., No. 44 Sqn.
Flt. Lt. L. GEEKIE, R.A.F.V.R., No. 195 Sqn.
Flt. Lt. R. A. H. GIBVAN, R.A.F.V.R., No. 692 Sqn.
Flt. Lt. R. G. GODDARD, R.A.F.V.R., No. 128 Sqn.
Flt. Lt. V. F. GODDARD, R.A.F.V.R., No. 571 Sqn.
Flt. Lt. D. F. GOSLING, R.A.F.V.R., No. 142 Sqn.
Flt. Lt. J. GREGORY, R.A.F.V.R., No. 61 Sqn.
Flt. Lt. B. B. HARDMAN, R.A.F.V.R., No. 103 Sqn.
Flt. Lt. R. R. HARDWICKE, R.A.F.V.R., No. 150 Sqn.
Flt. Lt. L. W. HARKER, R.A.F.V.R., No. 692 Sqn.
Flt. Lt. R. H. HAWKEN, R.A.F.V.R., No. 692 Sqn.
Flt. Lt. N. E. O. LILLEY, R.A.F.V.R., No. 608 Sqn.
Flt. Lt. A. W. MAIR R.A.F.V.R., No. 571 Sqn.
Flt. Lt. G. A. NUNN, R.A.F.V.R., No. 608 Sqn.
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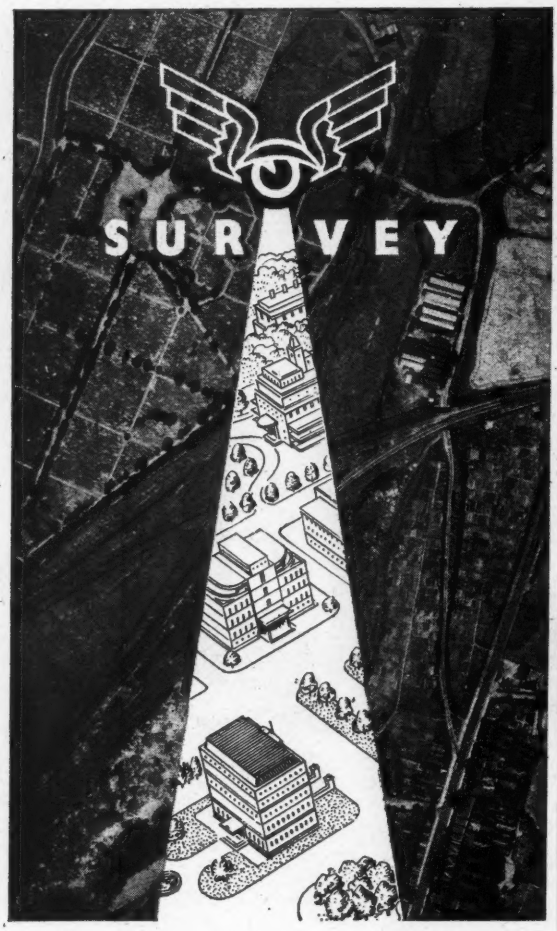

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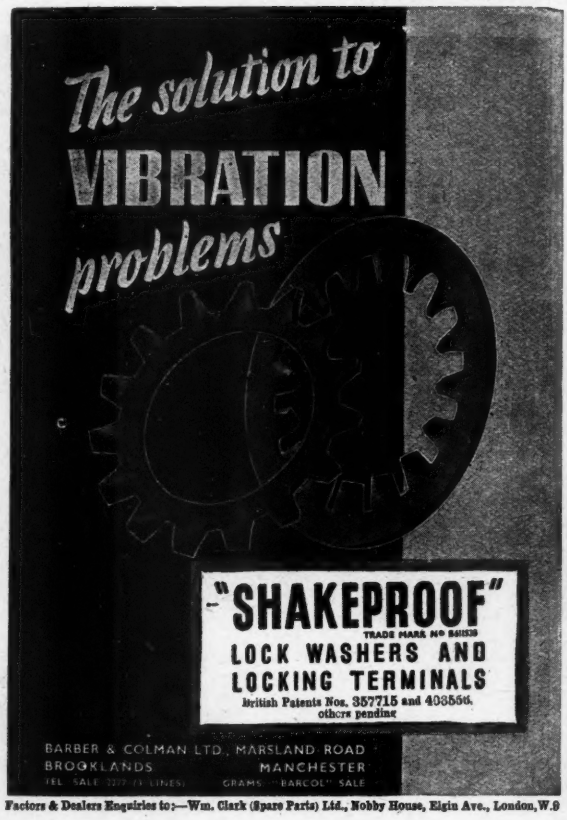

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Air Marshal the Hon. Sir Ralph A. Cochrane

(Caricature portrait by Hayden)

AIR MARSHAL THE HON. SIR RALPH A. COCHRANE, K.B.E., C.B., A.F.C., is the A.O.C.-in-C., Transport Command. Recently he commanded a Special Group in Bomber Command, and was noted for his insistance on meticulous accuracy in bombing. His flying history is a long one. In 1908 he entered the Royal Navy from Osborne and served with the Grand Fleet in the first world war. Later he joined the Airship Wing of the R.N.A.S., and in 1919 transferred to the Royal Air Force.

In the inter-war years he served in Egypt, Palestine, Iraq, and Aden. At Aden he commanded No. 8 (Bomber) Squadron which was responsible for the tranquillity of the Hinterland. Those who heard his lecture to the Royal United Service Institution on the work of No. 8 Squadron are not likely to forget it. He expounded in the clearest manner how the squadron kept the unruly tribes in order with a minimum of bloodshed to either side (if we mistake not, the casualties to the squadron were nil) and at a minimum of expense to the British taxpayers. An Army expedition in that country would have been costly in both blood and money. "Police bombing" has often been stigmatised as inhuman. The records of Aden show it to be the reverse. The tribesmen are not slaughtered, only ousted from their village.

Since then, Sir Ralph has passed through the R.A.F. Staff College and the Imperial Defence College. He has been Chief of the New Zealand Air Staff. During the second world war his services in Bomber Command were outstanding, and as A.O.C.-in-C., Transport Command, he now holds one of the most active appointments in the Royal Air Force. Personally, he is popular with all who enjoy his acquaintance. He never forgets a man.

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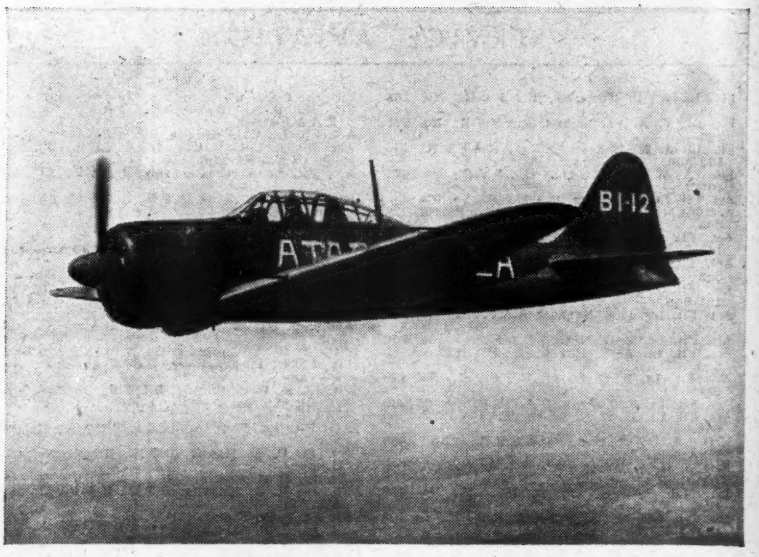

REMOTE CONTROL: Japanese Naval pilots, under R.A.F. supervision, are engaged in testing Jap aircraft taken over after the surrender. The aircraft shown here is a Zeke, Japan's standard carrier-based fighter throughout the war, which was famous for its manoeuvrability.

Act. Flt. Lt. L. C. BAINES, R.N.Z.A.F., No. 514 Sqn.
Act. Flt. Lt. B. P. W. DALCOM, R.N.Z.A.F., No. 109 Sqn.
Act. Flt. Lt. J. T. MCGREAL, R.N.Z.A.F., No. 109 Sqn. (with effect from April 24, 1945) (since deceased).
F/O. M. A. AUSTIN, R.N.Z.A.F., No. 100 Sqn.
F/O. L. E. DOVEY, R.N.Z.A.F., No. 35 Sqn.
F/O. R. G. EVANS, R.N.Z.A.F., No. 692 Sqn.
F/O. H. W. HOOPER, R.N.Z.A.F., No. 75 (N.Z.) Sqn.
F/O. A. J. MAYFIELD, R.N.Z.A.F., No. 128 Sqn.
F/O. M. A. PETERSON, R.N.Z.A.F., No. 692 Sqn.
F/O. L. F. ROBINSON, R.N.Z.A.F., No. 149 Sqn.
F/O. R. G. WEBSTER, R.N.Z.A.F., No. 128 Sqn.
P/O. K. B. FITTON, R.N.Z.A.F., No. 195 Sqn.
Capt. M. H. METER, S.A.A.F., No. 619 Sqn.
Capt. D. S. TUBNER, S.A.A.F., No. 630 Sqn.
Capt. I. F. WATSON, S.A.A.F., No. 102 Sqn.
F/O. W. B. SMITH, R.C.A.F., No. 692 Sqn.
F/O. F. M. SULPHER, R.C.A.F., No. 170 Sqn.
F/O. M. R. TALBOT, R.C.A.F., No. 150 Sqn.
F/O. S. R. WALLIS, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
F/O. D. S. CAREY, R.A.A.F., No. 571 Sqn.
F/O. I. R. CARTER, R.A.A.F., No. 576 Sqn.
F/O. W. R. CLARK, R.A.A.F., No. 692 Sqn.
F/O. E. W. B. DENTON, R.A.A.F., No. 128 Sqn.
F/O. E. C. EDGAR, R.A.A.F., No. 692 Sqn.
F/O. L. O. LUHRS, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
F/O. R. B. OLLIS, R.A.A.F., No. 101 Sqn.
F/O. A. W. A. RUDLING, R.A.A.F., No. 195 Sqn.
F/O. B. C. WINDRIM, R.A.A.F., No. 625 Sqn.
F/O. R. H. WOODWARD, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
P/O. A. C. BLAKNEY, R.A.A.F., No. 571 Sqn.
P/O. C. F. HENDRY, R.A.A.F., No. 571 Sqn.
P/O. M. H. MCVEY, R.A.A.F., No. 35 Sqn.

Distinguished Flying Medal

Flt. Sgt. M. BARBY, R.A.F.V.R., No. 630 Sqn.
Flt. Sgt. E. J. CUTTING, R.A.F.V.R., No. 9 Sqn.
Flt. Sgt. K. G. I. DE LA MARE, R.A.F.V.R., No. 460 (R.A.A.F.) Sqn.
Flt. Sgt. J. D. HARRISON, R.A.F.V.R., No. 83 Sqn.
Flt. Sgt. S. HODGSON, R.A.F.V.R., No. 10 Sqn.
Flt. Sgt. H. LOMAS, R.A.F.V.R., No. 158 Sqn.
Flt. Sgt. E. OGDEN, R.A.F.V.R., No. 156 Sqn.
Flt. Sgt. H. J. STONE, R.A.F.V.R., No. 640 Sqn.
Flt. Sgt. P. L. WHITTAKER, R.A.F.V.R., No. 617 Sqn.
Flt. Sgt. F. G. BURN, R.A.F.V.R., No. 83 Sqn.
Flt. Sgt. J. DUNCAN, R.A.F.V.R., No. 466 (R.A.A.F.) Sqn.
Flt. Sgt. G. W. F. FELL, R.A.F.V.R., No. 424 (R.C.A.F.) Sqn.
Flt. Sgt. W. MCL. GRANT, R.A.F.V.R., No. 424 (R.C.A.F.) Sqn.
Flt. Sgt. S. J. MARSHALL, R.A.F.V.R., No. 9 Sqn
Flt. Sgt. R. A. MORTON, R.A.F., No. 9 Sqn.
Flt. Sgt. J. S. PARKES, R.A.F.V.R., No. 9 Sqn.
Flt. Sgt. H. RAMSDEN, R.A.F.V.R., No 106 Sqn.
Sgt. C. ENTWISTLE, R.A.F.V.R., No. 460 (R.A.A.F.) Sqn.
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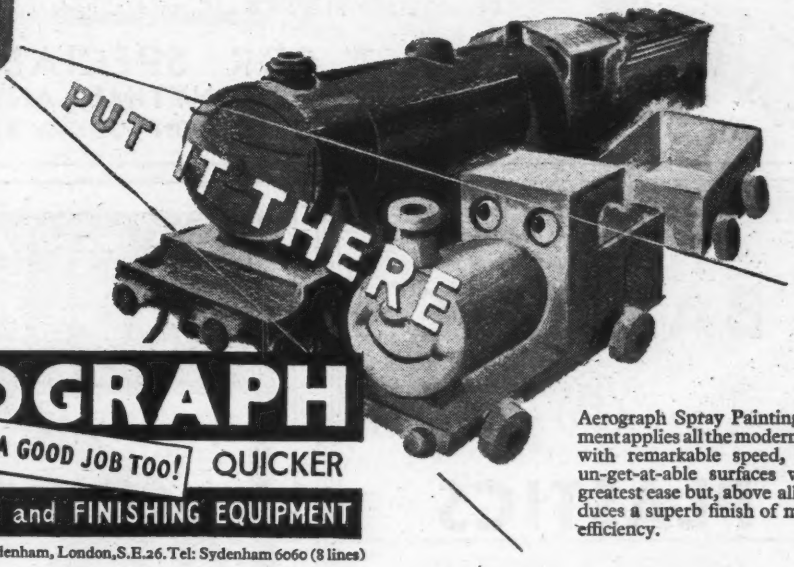

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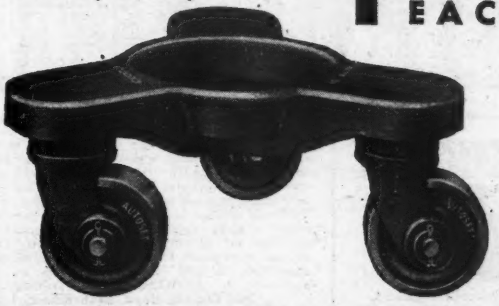

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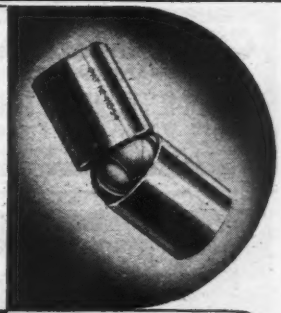

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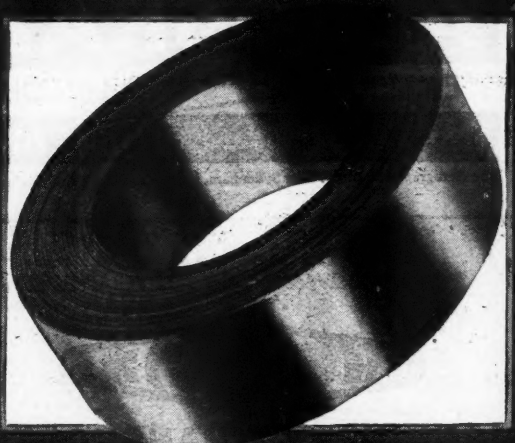

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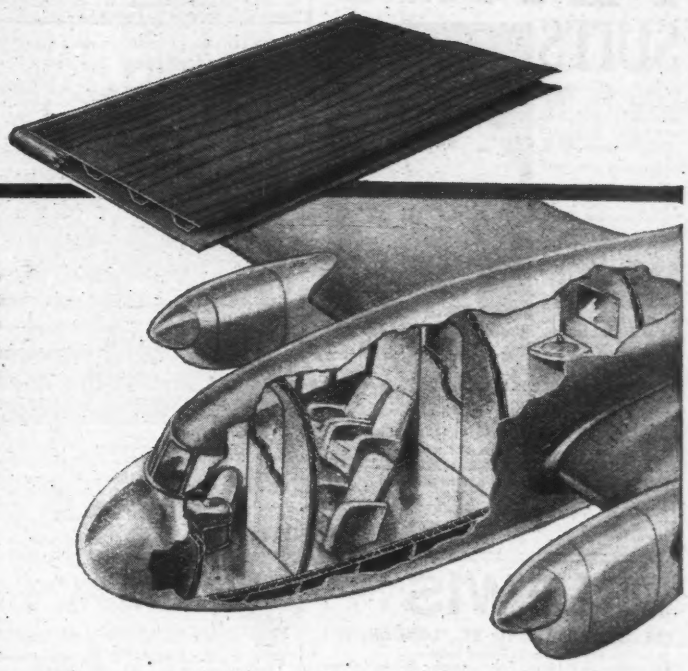

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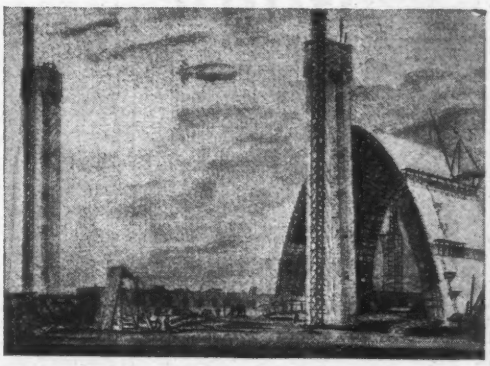

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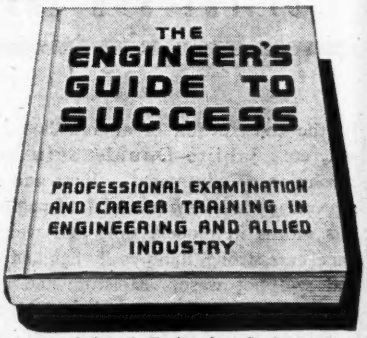

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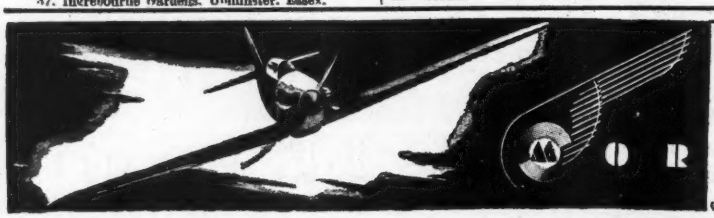

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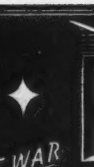

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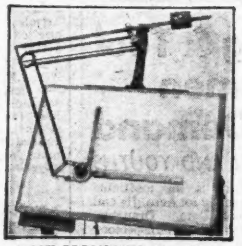

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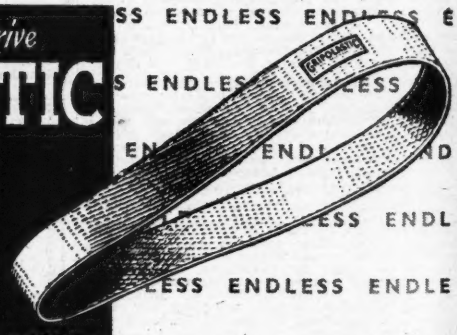

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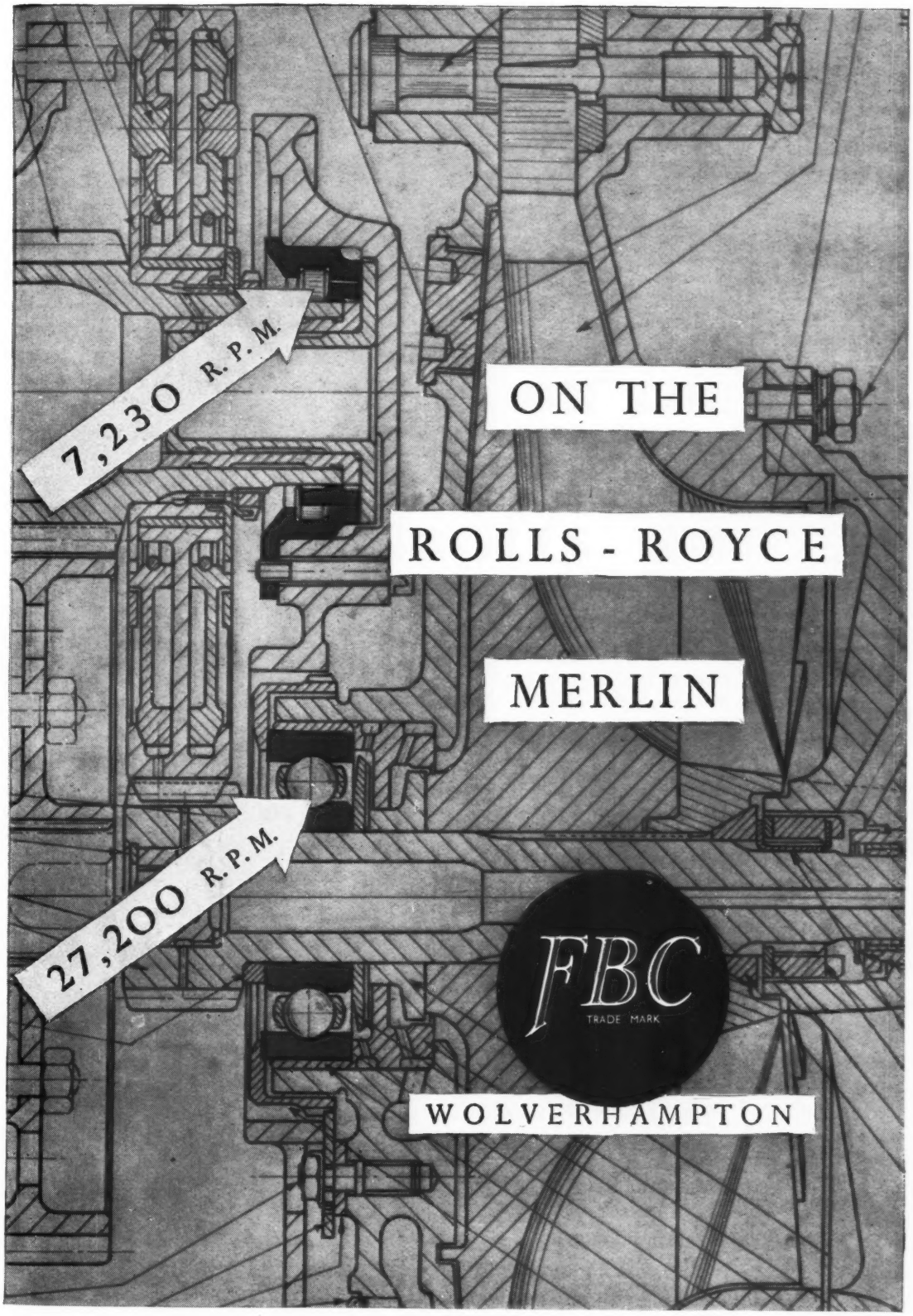
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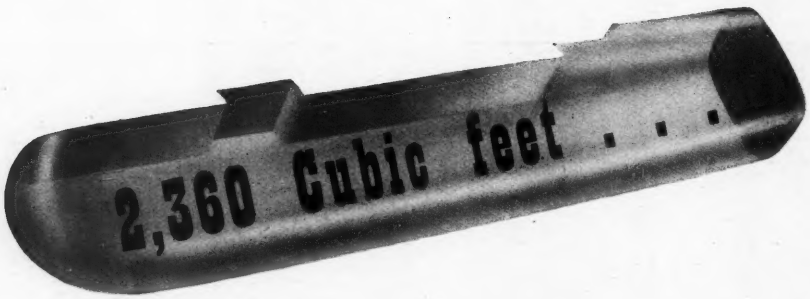

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